



# Greater Grand Canyon Landscape Assessment

## Workshop 2

June 10 – 11, 2014

---

Workshop 2 of the Greater Grand Canyon Landscape Assessment was held at the Health and Learning Center on the NAU Campus on June 10 and 11, 2014. The purpose of the workshop was to review and explore the spatial data developed for the stakeholder prioritization process identified in Workshop 1, using stakeholder-identified values and threats.

### Day 1

**In attendance:** William Austin, USFWS; Timothy Begay, NN-HPD; Rachel Bennet, NPS-GRCA; Ellen Brennan, NPS-GRCA; Charley Bullets, Kaibab Paiute Tribe, Southern Paiute Consortium; Peter Bungart, Hualapai Tribe; Windy Bunn, NPS-GRCA; Melinda Ciocco, NN-HPD; Roger Clark, GCT; Kevin Dahl, NPCA; Lance Diskan, Flagstaff Dark Sky org; Janna DuShey, KNF; William Flatley, NAU; Santiago Garcia, NPS-GRCA; Eric Gdula, NPS-GRCA; Alicyn Gitlin, Sierra Club; Martha Hahn, NPS-GRCA; Dick Hingson, Sierra Club; Greg Holm, NPS-GRCA; Linda Jalbert, NPS-GRCA; Mike Kearsley, NPS-GRCA; Marissa Kelly, NPS-GRCA; Holly Kleindienst, KNF; Drew Leiendecker, KNF; Lori Makarick, NPS-GRCA; Mark Nebel, NPS-GRCA; Doug Nering, GC Hikers and Backpackers Assn; Jodi Norris, NPS-SCPN; Mark Sappington, NPS-LAME; Donna Shorrock, NPS-IMR; Valerie Stein-Foster, KNF; Travis, Wooley, TNC; Kevin Wright, BLM-Vermillion Cliffs NM.

### GGCLA Core Team:

Tom Sisk, PI, LCI; Todd Chaudhry, PI, GRCA; Clare Aslan, Brett Dickson, Cerissa Hoglander, Jean Palumbo, Jill Rundall, Sasha Stortz, Luke Zachman

## Workshop Summary

### 1. Welcome and introductions

- 1.1. Tom Sisk (TS), Director of the Landscape Conservation Initiative (LCI) of NAU and Co-PI of the GGCLA project, welcomed the participants to Workshop 2, thanked everyone for attending, and described the vision and purpose of the GGCLA project. Introduced Martha Hahn, Chief of Science and Resource Management for Grand Canyon NP (GRCA).
- 1.2. Martha Hahn – Thanked all for attending on behalf of Dave Uberuaga, Superintendent for GRCA, who could not attend.
  - Described how the GGCLA project reflects the reality that GRCA is not an island, and that the park does influence areas outside of the park and vice versa. Therefore, it is

### Acronyms and symbols

GGCLA: Greater Grand Canyon Landscape Assessment  
GRCA: Grand Canyon NP  
GCT: Grand Canyon Trust  
KNF: Kaibab National Forest  
LAME: Lake Mead NRA  
LCI: NAU Landscape Conservation Initiative  
NPCA: National Park Conservation Assn.  
NPS: National Park Service  
NPS-IMR – NPS Intermountain Region  
NRCA: NPS Natural Resource Condition Assessment  
NNHPD: Navajo Nation Historic Preservation Dept.  
NAU: Northern Arizona University  
SCPN: Southern Colorado Plateau Network  
TWG: Technical Work Group  
TNC: The Nature Conservancy

important to understand what is going on at a landscape scale, and to consider the values and needs of the park's neighbors.

- Described how the GGCLA fit into the NPS planning process.

1.3. TS summed up what we are doing and why it's important, and invited everyone to introduce themselves.

## 2. Workshop objectives

2.1. TS projected an image of the Grand Canyon region taken from the shuttle and invited the attendees to shift their perspective and look at the region as a large, integrated whole. He pointed out the transition at the boundary between GRCA and Kaibab NF (KNF), which is visible on the map and a product of the different types of management in the different agencies. The GGCLA strives for a more integrated approach.

2.2. TS presented **objectives** for Workshop 2:

- Provide updates on the GGCLA process including spatial model and data development
- Review and explore spatial data developed for stakeholder prioritization process, and discuss spatial data layers and their uses
- Develop and explore landscape prioritization based on stakeholder-identified values and threats
- Discuss appropriate weights, ranks and uses of spatial data in identifying priority areas for management actions
- Identify recommended refinements to the prioritization process and clarify expectations for a final spatial prioritization to be reviewed and explored at a third and final workshop

2.3. TS provided background on the GGCLA, beginning with Workshop 1 in October 2012, and including definition of the analysis area, the three regions for analysis, the Technical Work Group meetings and the September 2013 Open House.

2.4. TS described **the participatory analysis process**, which is happening in parallel with the NPS Natural Resource Condition Assessment (NRCA), and how both processes will feed into and inform the final products for the project.

- Todd Chaudhry (TC), senior ecologist for GRCA and Co-PI for the GGCLA project talked about how decisions are to be informed by values and data, which are complementary, even though they are different things. Also talked about how different types of data can be incorporated, for example, information from opportunistic observations – at



one end of the spectrum, and from research vetted through peer review at the other end can be weighted in terms of value and emphasis.

A reactive organization makes decisions in a conflict situation, which aren't always the best decisions. This participatory process will help to inform decisions down the road, so that we can make better informed decisions that better meet our collective goals.

TS: We are building consensus through this process. Values can be incorporated in an informed way, such that science supports a clarification of public values.

- Question: There are an abundant # of decisions by various stakeholder to be made in the next couple of years. Have you stated these upcoming questions in order to help inform this discussion? TS's response – we addressed this in Workshop 1 where we asked stakeholders to identify values and risks. The list of prioritized data needs reflected the issues that stakeholders identified. However, there is an imperfect match between the wish list and what gets delivered. If there are major gaps – the job of this analysis is to identify those gaps and determine how they can be filled in the future.

2.5. TS compared the NRCA process to the GGCLA process, identifying the additional elements in the GGCLA and those elements that are outside of the scope of the project (Table 1)

Table 1. Comparison of GGCLA to NPS Natural Resource Condition Assessment		
NRCA Standard Elements	GGCLA Additional Elements	Outside of Scope of GGCLA
Multidisciplinary approach	Collaborate with stakeholders	Assess condition of all park resources
Use existing data	Assess cultural resources	Conduct robust quantitative analysis for all focal resources
Assess current conditions and trends of natural resources re: reference conditions	Assess contiguous lands outside of park	Analyze alternative futures (e.g. climate change)
Assess threats to resources	Conduct integrated spatial analysis	Identify specific management strategies and actions
Describe methods, assumptions and level of confidence in results	Identify priority areas based on values and threats	
Identify data gaps	Identify future research and monitoring needs	
Produce written report and GIS products		

2.6. TS described examples of similar efforts conducted by LCI in the past

- Western Mogollon Rim Landscape Assessment – prioritization map overlaid with Wallow fire – coincided with the highest priority areas identified in this process –



demonstrated that this process created meaningful result. Had we had more time and resources to commit, we might have been able to mitigate those losses

- Northern New Mexico Landscape Assessment workshop in Taos, NM in 2006 focused on watersheds
- Small diameter wood supply project in northern Arizona
- Kaibab Forest Health Focus. Over time, these efforts can influence future projects.

2.7. TS described the purpose of today's breakouts (see below) and urged everyone to think hard and reach deep in exploring the spatial data in order to get at those values on the landscape. The role of the spatial analysts that will be working with them is to help do this.

- Explore spatial data
- Review prioritization approach and process
- Conduct initial prioritization

2.8. Question: How are we determining threats? – is it just urgency?

TS response: Threats were identified as having the potential to influence those values that have been identified by stakeholders. The goal is to try and protect the values and also to address the stressors by trying to manage them so they become less of a threat. The next question would be “what do we do?”. If a value is not susceptible to management activity, it won't contribute to prioritization. He reminded participants that we are not moving to a prescriptive process, and acknowledged that could be a bit frustrating.

- Question: Will there be an attempt to map the stressors? Answer: Yes.

### 3. Data Overview

3.1. Jill Rundall (JR), LCI

- Study extent
- What we learned in Workshop 1 –values and stressors to values were identified deliberately and prioritized with dot votes. This provided a list of priorities for developing spatial data. Some of this is in the data atlas, and some is not available.

3.2. TC addressed additional data development –through CESU funding for Conservation Science Partners to develop spatial products and models. He mentioned that at this stage, we want to present draft products, take feedback from participants, and use this to refine the spatial products. The GGCLA Workshop 2 Data Atlas represents only a subset of the layers we have to play with today and tomorrow.



- 3.3. JR: Review of draft data layers developed thus far from existing data gathered from various sources.
- 3.4. Brett Dickson (BD), president and chief scientist, Conservation Science Partners (CSP) presented data layers developed from models.
  - Question – is there consideration of wildlife corridors? How are you dealing with the edge, beyond the analysis areas? BD's answer was yes, we have accommodated edge effects.
  - Question: are your wildlife models based on landscape models? BD's response was that all the wildlife models were drawn on telemetry data —except for mule deer.
4. **Example prioritization.** TS walked the group through an example prioritization focused on Wildlife climate adaptation. The goal was to identify the most important areas for assisting wildlife in adapting to climate change.
  - 4.1. In prioritizing areas through which animals can disperse and redistribute themselves through the landscape, high value habitat was represented by the biodiversity and ecological integrity layers. Distance to roads is a negative habitat factor.
  - 4.2. Question about weighting: Why did you use 2's and 3's? (Weighting scheme built into the model is 1-4 highest). You could argue that different weights are different values. TC's response– if you don't assign weights – by default, you are weighting them all the same. TS added that we could change the weights and run the model again and see how sensitive it is to the weights with diff weights. Also, keep in mind that the weights are relative.
  - 4.3. We looked at the top 10% of the prioritized landscape that resulted from the example model. Illustrates how you can start with a conception of what's important, but there are many ways to take that information and turn it into a picture.
5. TS provided a preview of the afternoon's work for the breakout groups. Each group should address Above the Rim, Below the Rim, and the River Corridor in that order. River corridor (RC) will present special challenges. While the first two are large areas, the RC is a ribbon, only a few pixels wide. How will we represent the relative priorities along the River? Also is an area where we have had challenges obtaining the data.
6. **The Aesthetics of Conservation:** Lunch program by artist Bruce Aiken, long associated with the Grand Canyon.
7. **Small Group Break Out Session 1**
  - 7.1. Objective: to collaboratively prioritize areas for management attention
  - 7.2. Strategy: identify key values and stressors, and the spatial data to represent them; assign relative weights to values and stressors. Do this for all three regions.



- 7.3. Summaries of the small group breakout sessions start on page 12.
8. Report back the results of each break out group to the combined group
- 8.1. There was a steep learning curve and it took all three groups a lot of time to get the hang of it and make progress. None of the groups tackled the River Corridor prioritization.
- 8.2. Observations: One group did not identify the spatial layers to represent the values they identified. One group did not weight the values or the stressors. Another group assigned weights and then voted and took the average of weights. One group separated experiential values from ecological values and then addressed only the ecological values above the rim and the experiential values below the rim.
9. TS: **Day 1 wrap up comments and reflections**
- 9.1. Acknowledged that this was a difficult exercise. Asked: How clear were each of you about how to establish priorities? What's the alternative? To just react?
- 9.2. Asked, how high was the level of agreement? People felt relatively comfortable, and yet it was hard to do.
- 9.3. Even though there were a lot of data gaps, we had been able to gather together more than had ever been available to the park previously. However, the available data are never enough.
- 9.4. Combining apples with oranges in this way is always challenging, but sometimes necessary.
- 9.5. Prioritization must be an iterative process.

## Day 2

**In attendance:** Donna Shorock (NPS), Greg Holm (GRCA), Drew Leiendecker (KNF), Holly Kleindienst (KNF), Marissa Kelly (GRCA), Jonna DuShey (KNF), Abe Springer (NAU), Craig McMullen, (AZGFD), Martha Hahn (GRCA), Mark Sappington (NPS-LAM), Jodi Norris (NPS-SCPN), Pete Bungart (Hualapai), Mark Nebel (GRCA), Alicyn Gitlyn (Sierra Club), Valerie Stein Foster (KNF), Bill Austin (USFWS), Dick Hingson (Sierra Club), Doug Nerring (Grand Canyon Backpacker's Association) Tim Begay (Navajo Nation), Terry Morgart (Hopi Cultural Preservation Office), Melinda Ciocco (Navajo Nation), Linda Jalbert (GRCA), Mike Kearsley (GRCA), Jane Rogers (GRCA), Todd Chaudhry (GRCA), Rachel Bennet (GRCA), Kevin Wright (BLM), Travis Wooley (TNC)

## 10. Small Group Breakout Session 2

- 10.1. In small groups, spatial analysts presented the initial prioritizations they produced overnight and reported on any substitutions or modification of spatial layers they made in order to capture the values and stressors as accurately as possible.



10.2. Groups evaluated the resulting prioritization maps—did they capture the intent of the group? Discussed how to refine them.

10.3. Summaries of break out groups and maps of each group’s priority maps are attached starting on page 12 and 23, respectively.

11. **Report out: Comparison of Small Group Prioritizations** – all three groups reconvened to discuss their results and prepare presentations of results for large group.

11.1. **Yellow group**

• **Participant comments:**

- Concern was voiced about dark night skies being relegated to below the rim. Response was that we are acknowledging that resources identified for below the rim are affected by stressors above the rim as well as below the rim. The same person also felt that night sky values should be “housed” with infrastructure rather than wilderness. However, infrastructure is a stressor for dark night skies, and dark night skies are a component of the wilderness value.

11.2. **Blue Group**

• **Participant comments**

- (above rim) Focused on mule deer as a value, and fire severity and the inverse of ecological integrity as a stressor
- (above rim) The group was concerned about the lack of population data for wildlife.
- (below rim) Lack of data for hydrology and water use was a concern.

11.3. **Green Group**

• **Participant comments**

- Suggested that it might be better to divide the area into east versus west. For example, trails could be a value or a threat, depending on what area you are looking at.
- Some group participants commented that it was challenging to value different parts of the landscape from a cultural perspective. Some tribal representatives would be interested in taking a different approach.

11.4. **General comments**



- Regarding the river corridor and below the rim, these are not natural environments as a result of the dam. How do we address the effects of the dam?
- Two of the three groups felt that the results of the prioritization were as they expected.

## 12. Implications of preliminary analysis and next steps

### 12.1. TS: Three possible courses of action:

1. Average the three prioritization results
2. Pick one prioritization and go with it
3. Refine the concept and do it differently

### 12.2. Participant comments

- We're trying to cram in too much, too many values, missing data. I know we have a product I can't endorse. BUT, it's the process that is fascinating and important. My priorities may change because of this process. I don't have time to learn all of this. It is the responsibility of the park staff.
- Perhaps we are looking at suggestion #3. If we add all three together, the priorities will be everywhere. If we redefine, we can narrow it down.
- Question: Are there shared values across the multi-agency managers here today?
- I was struck by the fact that people with similar values came up with such different prioritization results.
- Do you think it would be more tractable to break up the areas?
- We should more closely tie the stressors selected to the values identified.
- I think the process was valid, but am uncomfortable with the underlying datasets.
- Averaging the three or picking one of the scenarios is not the way to move forward. We should refine and do it again.
- The way we assigned the exercise influenced the result.
- There was much more overlap among the three scenario results for below the rim.
- TS confirmed that the sense of the group was to refine the concept and do another prioritization. He committed to working with the core team and coming back with something that meets the group's intent.

### 12.3. How do we move forward on the River Corridor?



- It should have a high priority, but not in this process—there are many studies dealing with the River.
- We are missing some of the overall connections to the landscape. There are a number of discharges at the river level, which have always been missing from other assessments. 3,000-4,000cfs of discharge at the river level are never analyzed.
- We need to look at both the aquatic and riparian habitats. Just having a general understanding of the landscape is not enough. What's more important is figuring out what is not known.
- Night skies are an important aspect of the river corridor.
- We need to look at the ecological and user aspects of the river corridor, and in the other two areas. Tributaries should be included in the river corridor. The river is highly compromised and diversity is coming from the tributaries.
- TS: acknowledge that the river was both heavily studied and important to stakeholders, and that it might be addressed but through a different approach than the prioritization used above and below the rim.

12.4. TS: Asked two questions: First- Of the datasets that weren't available, what were the most important pieces that you felt were needed?

- Soundscape-related data layers, including noise maps (% time audible), which are a measure of motorized impact on visitor experience; and LEQ audible – which is the sound intensity of the sound during the times it can be heard.
- What about non-data information – things that define greater meaning – night sky has profound meaning and is difficult to quantify.
- (Blue Group) Water resources, including hydrology, wildlife population and diversity, endemic vegetation
- Visitor use data in other areas (e.g. Havasupai and Hualapai)
- Potential renew energy development locations
- Related to additional wildlife data – RMBO has data layers
- Other invasive types
- A mechanism to connect threats to water resources, tied in with hydrology,

12.5. Second question (TS): You've been introduced to the data that we've developed. Would any of these layers be useful for other purposes?



- For example, a prioritization process that can be implemented in a different setting for a more immediate use. We could work with you to transfer this process. We invite your further input and requests.
- Question: When will this be publically available? Answer: all non-sensitive data will eventually be publically available. However, before sharing, we want to be able to provide it in a form that recognizes its strengths and short comings with proper metadata and other details.

12.6. TS reviewed the GGCLA objectives and our progress and successes. He acknowledged that looking at so many factors in an integrated way is a new approach, as is including stakeholders at the front end.

12.7. TC added: A lot of the products that we have been working with on the Resource Condition Assessment side will plug into this and provide insight into the overall condition of these resources. A number of products are still to come, for example:

- tributary/riparian veg comp/structure/change over past years,
- Northern Leopard frog habitat suitability model
- river avifauna
- database of archeological sites, where we have condition analysis for each of sites, trends over time
- caves assessment
- night skies assessment
- wilderness character

### 13. Timeline review

13.1. Wrap up with Workshop 3 this winter, finish report in 2015

13.2. Will need peer review – if anyone is interested in providing this service, let TC know

13.3. Report will be publically available.

### 14. Final comments and questions

14.1. Question: Have you considered impact thresholds? Answer: that might be the next step after this process, to identify threshold as it relates to a particular resource, then identify management actions.



- 14.2. Participant comment: This is amazing, all the effort and caring that's gone into it is appreciated! Over the course of the project timeline, we can see that much progress has been made.
- 14.3. TS's takeaway--To see how diffuse and incomplete a lot of this information is, to try to assemble is not an easy task, but a necessary one.
15. Martha Hahn – Park currently has many research proposals. This effort will help us to target and focus research proposals in the park and increase our collaborative prospects. Keep in mind that a lack of data is not a failure, but helps us to determine how to move forward.
16. TS: There has been a lot of excellent work, but noteworthy that much of that does not directly answer difficult management questions we face now.
17. TS acknowledged that it was a challenging workshop in many ways and thanked everyone for their hard work and participation over the course of the workshop and project.



## Attachments: Break out group summaries, prioritization maps

### 1. Blue Group Summary

Facilitation Team: Luke Zachmann and Sasha Stortz

#### Day 1

#### Scenario goal(s):

Conservation and protection of natural and cultural resources

#### Data representations for prioritization exercise

Above the rim: The group selected the following values-

- Mule deer connectivity (weight 0.05). This was to represent the importance of connectivity for multiple wildlife species; a desire for more integrated wildlife presence layer was expressed
- Biodiversity (weight 0.4) was selected as a representation of species richness, with the suggestion that water resources could also act as an important indicator of biodiversity
- Historic fire disturbance regimes (weight 0.1)
- Density of sensitive areas (caves, archeological sites and springs) (weight 0.4)
- Endemic plants (weight 0.05). This was considered very important to include in analysis, but it was felt that this data was insufficient, thus the low weight. A desire for endemic fauna, along with flora, was expressed.

The group selected the following threats-

- Climate departures from normal (weight 0.05). This was particularly of interest in terms of rim species that will be vulnerable to future climate change, with the idea that higher priority should be given to areas more likely to change
- Fire severity potential (weight 0.3). High fire severity potential and previously burned areas were considered a stressor
- Ecological pressure/human modification (0.3). The inverse of the ecological integrity layer was considered acceptable for purposes of the exercise. The primary interest in this representation was existing and proposed developments, and the presence of non-natives and disturbed areas
- Soundscapes (0.1). Noise impacts from overflights as well as noise from the presence of people (roads and trails as proxies)
- Grazing and forest management (0.25). Potential Landfire Disturbance layer: overgrazing, browsing, and trampling by native and non-native species (elk, bison, and cattle).



Below the rim: The group spent less time discussing below the rim. They selected sensitive resources (springs, caves and archeological sites) (weight 0.34), wilderness (weight 0.33) and biodiversity (weight 0.33) to be weighted essentially equally as values. For stressors, they selected sound impacts including local and overflights (weight 0.35) and discussed desire for a representation of visitor impacts, including over visitation, human waste, the impact of trails and developed areas. They thought that a map of back country use or the opposite of the ecological integrity layer, representing ecological pressures or human modification, would be an acceptable representation, with a weight of 0.65.

**Key ideas and discussion:**

- Ecological integrity- uncomfortable with definition used. This is a definition of “human use”. Ecological integrity should use more information about ecological processes- a functional ecological departure
- Representing sensitive areas is challenging; frustration not to be able to see it in the meeting
- Language – invasive vs. non-natives needs to be clarified
- Wildlife habitat representations: consider capturing vegetation change over time as an indicator of wildlife condition
- Data desire: use of water/groundwater pumping
- Data desire: springs and water flow below the rim

**Day 2**

**Data layers used in analysis performed overnight:**

Above the rim:

Values- Habitat connectivity for mule deer (0.05), multi-scale biodiversity index (0.4), historic fire regime (Landfire vegetation departure) (0.1), density of sensitive resources (0.4), density of endemic plants known locations (0.05)

Stressors- Fire severity potential (Landfire) (0.4), human modification (0.4), climate change (0.066), overflights (0.133)

Below the rim:

Values- multi-scale biodiversity index (0.34), density of sensitive resources (0.33), wilderness areas (0.33)

Stressors- backcountry use (percent by backcountry zone over the past decade) (0.4), overflights (0.2), human modification (0.4)



## Key ideas and discussion:

### Above the Rim Reflections

#### Value layers

- Strong associations with the rim itself due to weighting of biodiversity
- North rim mixed conifer doesn't come out as high priority, but seems like an unusual habitat. Consequence of choice of biodiversity over large intact ecosystems
- Value to using top 10% AND to looking at the full priorities layer with its details and variability
- How do we think of sacrifice areas versus high priority areas?

#### Stressor layers

- Unable to provide grazing data overnight, generating new ideas: can the TNC Arizona grasslands most threatened be a proxy for areas highly impacted by grazing? Defining grazing correctly as a stressor is important; desire for data to be tied to outcome on landscape. Not all grazing is bad.
- Ecological integrity "inverse" – resonates for some but not for others; intent of a human modification layer
- Some more remote areas, less visited areas come out for high in stress; worth visiting and addressing

#### Compilation

- Hot spots on values and stressors line up particularly on north and south rim; did we over-represent?
- Values in larger cohesive blocks
- Stressors are more diffuse than values were
- Strong signal similar on north and south rims

#### Refinements

- Ecological integrity/human modification might not be representing what we want it to
- Wildlife representations: population data is desired
- Representative sampling of endemics is needed

### Below the Rim Reflections

#### Values Layers

- Used currently designated and proposed wilderness as a proxy for wilderness character
- Sensitive resources; just the top 10% would be interesting, like distribution here more than above the rim
- Missed adding access as a value in the rush to finish the below the rim discussion on day 1

#### Stressors Layers

- Seeing strong response to back country use and overflights in East part of canyon

#### Compilation

- Less overlap of values and stressors than above the rim

#### Refinements



- Wilderness- could add road corridors, will have a wilderness character model in the future. Also, current layer doesn't show cross-canyon non-wilderness corridor
- Appropriate representations of access: type of access, vulnerability, representation of access on the river + inner canyon
- Ecological integrity/human modification can be better represented
- Hydrology/hydrologic process are needed below the rim

#### **Discussion on how to address the River Corridor in Analysis**

- Other processes analyzing it, should it even be addressed here?
- But, it's important to address too due to connectivity across the landscape; not an isolated dataset
- Existing river corridor definitions to drive on:
  - CRMP: river corridor and 2 miles up side streams (access points to/from river)
  - LTEMP: not sure how it will be defined yet
  - BMP: Various representations
  - Interactions between back country users and visitors from river
- There is lots of data, how do we get it, or what do we want?
  - Some issues are a spatial framework for existing data

**Concluding thoughts:** Representation of stakeholders at the workshop impacts the weights and selection of values and stressors. We are missing some voices and that is reflected in the maps produced

## **2. Green Group**

Facilitation team: Jill Rundall/Clare Aslan

### **Overview**

The Green group was charged with developing a prioritization scenario to identify areas for management attention in geographic areas of GGCLA of 'Above the rim', 'Below the rim' and the 'River corridor' by selecting values and stressors from the compiled list that were identified during GGCLA Workshop 1. The small break-out Green group met for several hours on each of two days. During that time it became apparent that the river corridor geographic area would need further refinement before a prioritization effort could be undertaken and it was set aside. With two remaining geographic areas to address, day 1 included the review and discussion of the list of values and stressors, what could be added to those and what they meant in the context of each of the geographic regions. The group focused on outlining identifying and describing what each value and stressor chosen represented within the context of the prioritization. Ultimately, the group identified specific values and stressors with relative weights for each layer (identified later) with



the total weight adding to 1 and explanations as to what they represent; however, the choice of which spatial data to use for representation of these were deferred to the facilitator and spatial analyst's discretion. Overall trends for values chosen included both ecological and cultural interests such as biodiversity, intact ecosystems, water, recreation and cultural landscapes, and archeological resources. Stressors identified included anthropogenic disturbances affecting ecological and cultural resources and visitor experience such as invasive species, threats to water resources, unnatural fire regimes, noise and light pollution, and industrialization. Several small group members had to leave before the small group session ended. During the morning of Day 2, the Green group had some time to see the output prioritization map, but perhaps less time than the other groups due to technical difficulties. In addition, not all members were able to return. Discussion and feedback from the Green group on Day 2 revealed some dissatisfaction with the areas prioritized based on pre-identified values, largely because no one person in the group felt that his or her priority areas were identified. Individuals in the group were concerned with, for example, fire, noise pollution, or cultural values, and the meld of multiple values reduced the focus on any particular set of such values. To improve the map results, the group felt that better base maps were needed to represent, in particular, healthy fire regimes, cultural values, and noise pollution, although they acknowledged that such maps were unavailable to the GGCLA team to bring into this Workshop. Another suggestion was that the Canyon be divided into three or more east-west segments, representing management areas that differ significantly in focus and goal (for example, the upper Canyon, main corridor, and lower Canyon), so that the values and resulting maps can be tailored to differing management needs.

### **Summary of group intentions**

#### **Above the Rim**

There were six values and three stressors chosen for the Above the Rim prioritization scenario. Values included fire and natural disturbance regimes, large intact ecosystems, wilderness values, scenery and viewsheds, wetlands and water sources, and archeological resources and traditional cultural properties. Stressors included industrialization and associated anthropogenic impacts, invasive and nuisance species, and unnatural fire regimes.

Representation of each value and threat with spatial data are described in detail in the scenario worksheet table and are summarized here.

#### Values

1. Fire, natural disturbance regime was chosen to capture the idea of the ponderosa pine forest community above the rim as influential of communities below the rim. The group felt that crown fire in particular represents an unhealthy fire regime reflected in very intense fires. Addressing areas of high crown fire activity that past experience shows to occur in this system will help protect other areas from the inevitable downstream effects that result from unplanned catastrophic wildfire. This value was depicted by selecting concurrent areas of ponderosa pine



vegetation type from LANDFIRE existing vegetation data and those of active crown fire as modeled in FlamMap at 97th percentile weather conditions. This layer was given the highest weight of 0.19.

2. Large intact ecosystems, wilderness values were identified as individual values for inclusion. Based on the group's purpose of including these two values of identifying areas that support native biological diversity and wilderness character and the importance of experiencing wilderness as a human experience, we represented both of these with one spatial layer for the analysis. This value was depicted by the ecological integrity spatial layer and given a weight of 0.38, a sum of the two weights assigned to the two initial values by the group.
3. Scenery and viewsheds were identified as important to distinguish vistas as one-of-a-kind, capturing the visitor experience, wonder, mystery and grandeur that is central to the character of the region. The visitor use viewsheds analysis was used to represent this value and was given a weight of 0.16.
4. Archeological resources / Traditional cultural properties value was important to the group to include acknowledging that cultural significance goes beyond the archeological resources and incorporates areas of value and activity. Through discussion this idea expanded to include traditional cultural properties that are in use currently including significant peaks and sites, trail networks and traditional use lands. The group also felt this would incorporate aspects of the visitor experience. This value was represented by spatial data of all traditional landscapes identified within the region that were available for GGCLA through the GRCA GIS and cultural staff. It was assigned a weight of 0.15 in the prioritization.
5. Wetland and water resource value was identified to be included by the group due to its connection with biodiversity and wildlife. A new data layer was derived for this value, combining spatial data of streams, springs, lakes and reservoirs locations. It had an assigned weight of 0.11.

#### Stressors

1. Industrialization and associated anthropogenic impacts stressors has a broad scope relating to human modification and ecological integrity for the Group. This included pollution from development, noise and light, air and water quality and energy development. Considerations that it could include resource extraction, ground water withdrawal, road networks and threats to- or access to traditional cultural properties as well. This was represented by the inverse of the ecological integrity model, giving the areas of high human modification high values with the assigned weight of 0.5.
2. Invasive and nuisance species were included as concerns of their impacts on ecological systems. These were represented with a new layer derived by combining two predictive models, the draft Bromus spp. and the USDA National Insect and Disease Risk composite data of percent of total basal area of all pests (damage agents) and all hosts (tree species). This layer was assigned a weight of 0.25.



3. Unnatural fire regimes were also considered important to identify areas where fire regimes may have changed, mainly due to suppression, creating greater density forests and as a landscape scale process that effects multiple resources. This stressor was represented with LANDFIRE's index of Vegetation Departure (2008, refresh), this depicts the amount of current vegetation departed from simulated historical vegetation reference conditions. It was assigned a weight of 0.25.

### **Below the Rim**

There were six values and four stressors chosen by the Green group for the Below the Rim prioritization scenario. Values included wilderness values, biodiversity, intact ecosystems, cultural landscapes, water resources, and recreational values. Stressors included overflight/noise pollution, light pollution, invasive species and threats to water resources

Representation of each value and threat with spatial data is described in detail in the scenario worksheet table and is summarized here.

#### Values

1. Wilderness values and intact ecosystems were identified as individual values for inclusion. The group's interpretation of these values was wilderness providing mysterious silence, deepest below the rim as one of the most special and fragile aspects of the region and in visitor experience and the idea of an intact landscape. The group described the latter as no roads signifying greater connectivity, less fragmentation except by natural processes, less development and degradation and not trammled. The ecological integrity model is an index of naturalness. Higher values represent a higher degree of naturalness (e.g. wilderness, fewer roads, less anthropogenic impact), while low values indicate a high degree of human modification. We represented both of these values with this single ecological integrity spatial layer for the analysis. It was assign the summed weight of those two values of 0.41.

2. Biodiversity as a way to incorporate the microsite and topographic and habitat diversity, transitioning between different ecosystem types. The potential biodiversity spatial layer was used and assigned a weight of 0.15.

3. Water resources were chosen by the Group to represent a refinement to biodiversity. Where these point and line features representing locations of spring and stream resources, with buffers, can be central to wildlife habitats. Smaller features integrated into the mapping can impact the outcome, offering a fine scale to help point in one direction or another. A new data layer was developed including the spring and perennial locations buffered 100 meters and weighted 0.18. This buffer, identified by the Group, hoped to capture areas that may be influenced by the water resources (e.g. vegetation, arthropod, avian and mammal diversity, etc.).

4. Cultural landscapes were chosen to try to encompass the archeological landscapes, traditional cultural properties and the idea of The Canyon as a home to people. This value was



represented by spatial data of all traditional landscapes identified within the region that were available for GGCLA through the GRCA GIS and cultural staff. It was assigned a weight of 0.14.

5. Recreational values was identified by the group with the idea that it is a large part of the inner canyon visitor experience. This was represented by trail density. Higher trail density relating to higher recreation opportunity. It was assigned a weight of 0.12. The group discussed the fact that recreational value means different things to different people (i.e., high trail density may be a negative from some perspectives) and concluded that subdividing the Canyon in an east-west fashion might result in different weighting or perhaps the use of the inverse of this metric in some subdivisions.

### Stressors

1. Overflight/noise pollution was considered by the group as the over-riding source of noise pollution with additions by motor boats. The inverse of a new data layer that was developed to represent calculating the distance from published air tour flight lines was assigned a weight of 0.36.

2. Light pollution: the group wanted to use light pollution as a proxy for development. They considered that small scale, focal, point stressors could increase in the future, such as the Escalade Project. Additional increases could come from the increasing light domes from communities such as Tusayan. This was represented with known existing and proposed development and weighted at 0.17.

3. Invasive species of plants in particular (cheatgrass) are of concern as well as river-associated species that move up into tributaries threatening unique vegetation community components such as hanging gardens. The potential cheatgrass model was used to represent this and weighted at 0.23.

4. Water resource threats capture the idea of the effects on seeps/springs related to development levels above the rim. There was interest in incorporating climate change, human attraction to water, wells, altered flow regimes and water availability (depth). Trail density spatial layer was used as a proxy to represent this stressor. Human attraction to water is facilitated and closely related to locations of trails. There are no well locations below the rim; altered flow regimes data is unavailable consistently for springs (e.g. Roaring Springs pumping to South Rim) and is more likely related to the Dam and main stem of the Colorado River. The group agreed that a better representative layer capturing water resources would be valuable to this process. Water resource threats were weighted at 0.24.



### 3. Yellow Group

Facilitation Team: Brett Dickson and Cerissa Hoglander

#### Day 1

##### **Scenario goal(s):**

Above the Rim: Restoring natural fire regime and/or forest structure and composition for purpose of maintaining habitat integrity and water quality/quantity; old growth forest health; maintaining a natural night sky; maintenance of intact and unpolluted ground water HRV; suitable habitat for T&E; protection of existing cultural resources and landscapes; protection of a range of (including quiet) recreation opportunities, maintaining soundscapes

Below the Rim: Opportunities for solitude, unconfined recreation, and enjoyment of cultural values; protection of existing cultural resources and experiences;

##### **Desired data layers:**

Above the rim: the group discussed using the following values in their scenario:

- The group discussed using dominant vegetation cover type (weight 0.3) in order to represent an indication of habitat, successional stage and condition class but ultimately decided against using this spatial data layer
- The group used biodiversity (weight 0.2), MSO recovery areas (0.3) and Northern Goshawk habitat (0.2) to indicate the areas of forest structure and composition they were most interested in
- Springs density (0.3) was discussed as an indicator of a functioning hydrological system

Above the rim: the group discussed using the following stressors in their scenario:

- Mining activity (0.1) as a representation of stressors on water quality
- Crown fire behavior or fire hazard (0.5) as a representation of uncharacteristic fire behavior
- Bromus probability (0.2) and bison locations (0.2) to represent how exotic species alter fire regimes, hydrological regimes and biodiversity

Below the rim: They discussed using the following values in their scenario, all weighted equally:

- Natural night skies
- Natural quiet; overflights and overall sound impacts



- Cultural values such as ethnographic and visitor use viewsheds
- Intact water sources, as an ecological and cultural value
- Sensitive resources (caves, springs and archeological sites)

Below the rim: They discussed using the following stressors in their scenario:

- Flight lines (weight 0.3)
- Development and infrastructure, with a focus on the things that impact water quality and quantity; viewshed/wilderness stressor (0.4)
- Visitation (back country use areas) (0.2); More control over visitation than some other stressors.
- Mines: The things that impact water quality and quantity, and the experience you might have in the vicinity of, e.g., a spring; above rim stressors (0.1).

## **Day 2**

### **Data layers used in prioritization analysis conducted overnight:**

Above the rim values: MSO recovery habitat (weight 0.3), Northern Goshawk habitat (0.2), multi-scale biodiversity index (0.20), density of known spring locations (0.3)

Above the rim stressors: Mining activity (0.1), crown fire behavior (0.5), cheatgrass occurrence (0.2), bison habitat (0.2)

Below the rim values: natural night skies (0.166), flight lines (0.166), ethnographic viewshed (0.166), visitor viewshed (0.166), ethnographic resources (0.166), intact waters (0.166).

Below the rim stressors: development and infrastructure (0.4), visitation (0.2), flight lines (0.3), mines (0.1)

### **Key ideas and discussion:**

#### *Above the Rim*

There was a bias towards the Kaibab NF because Mt. Trumbull and GC Parashant NM were not represented – indicated as no data

(Crown fire behavior was heavily weighted in the yellow prioritization – did this result in over prediction of fire severity in some veg types and some areas?)

The result of the prioritization for the areas within the park were what some of the group would expect.



*Below the Rim*

Changed from presence/absence of sensitive resources to a count of sensitive resources (cultural) by HUC 12 watershed. Drawback is that one really important ethnographic site would get overshadowed by other values.

Lack of data for Hualapai and Havasupai visitor use, but might be able to get Supai daily use permit info and Hualapai overflight data.

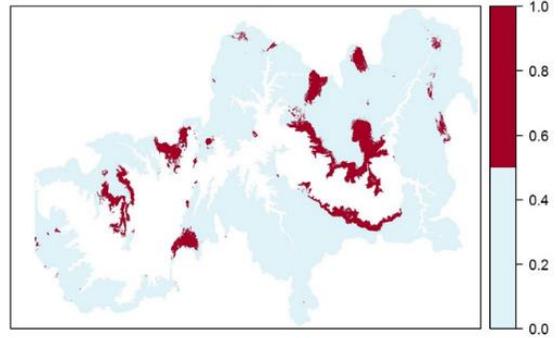
The group was surprised at the high level of stressors in Marble Canyon because there is not a lot of visitor use there.

Stressors for springs were not represented. Perhaps a geologic fault layer, karst layer, pumping well layer?

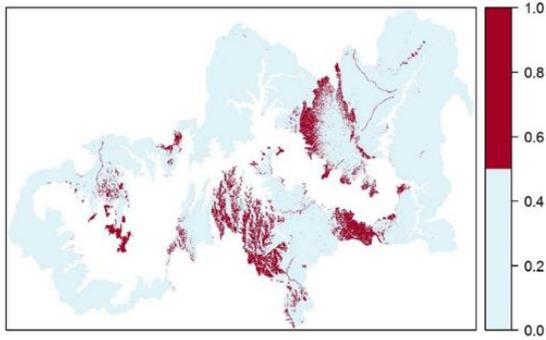


## Above the Rim Values Maps

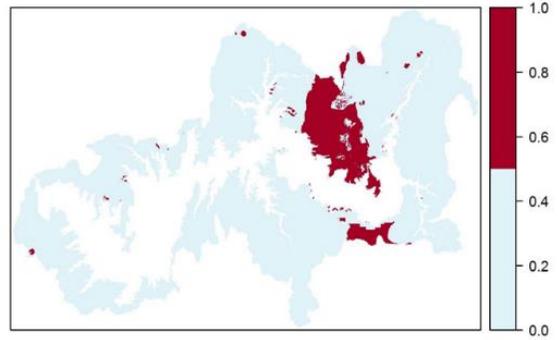
### BLUE



### GREEN

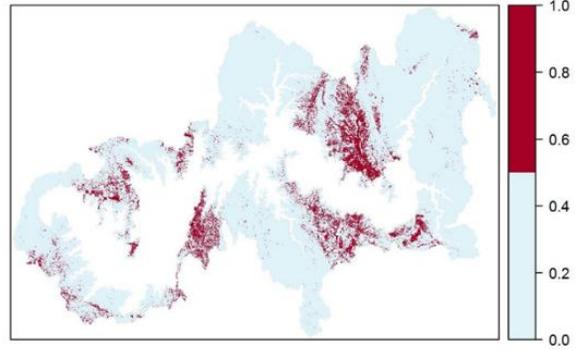


### YELLOW

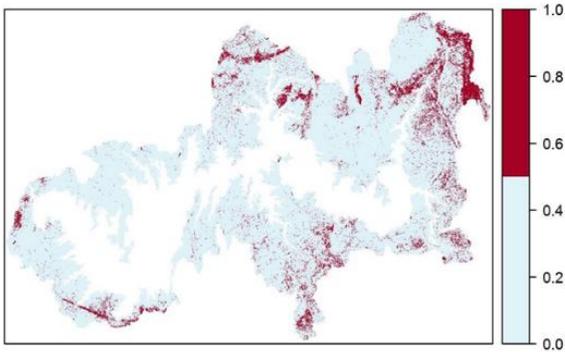


## Above the Rim Stressors Maps

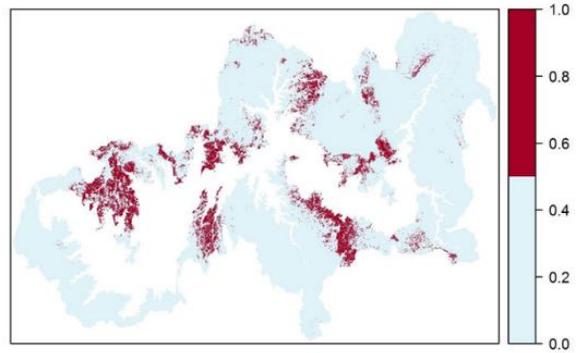
### BLUE



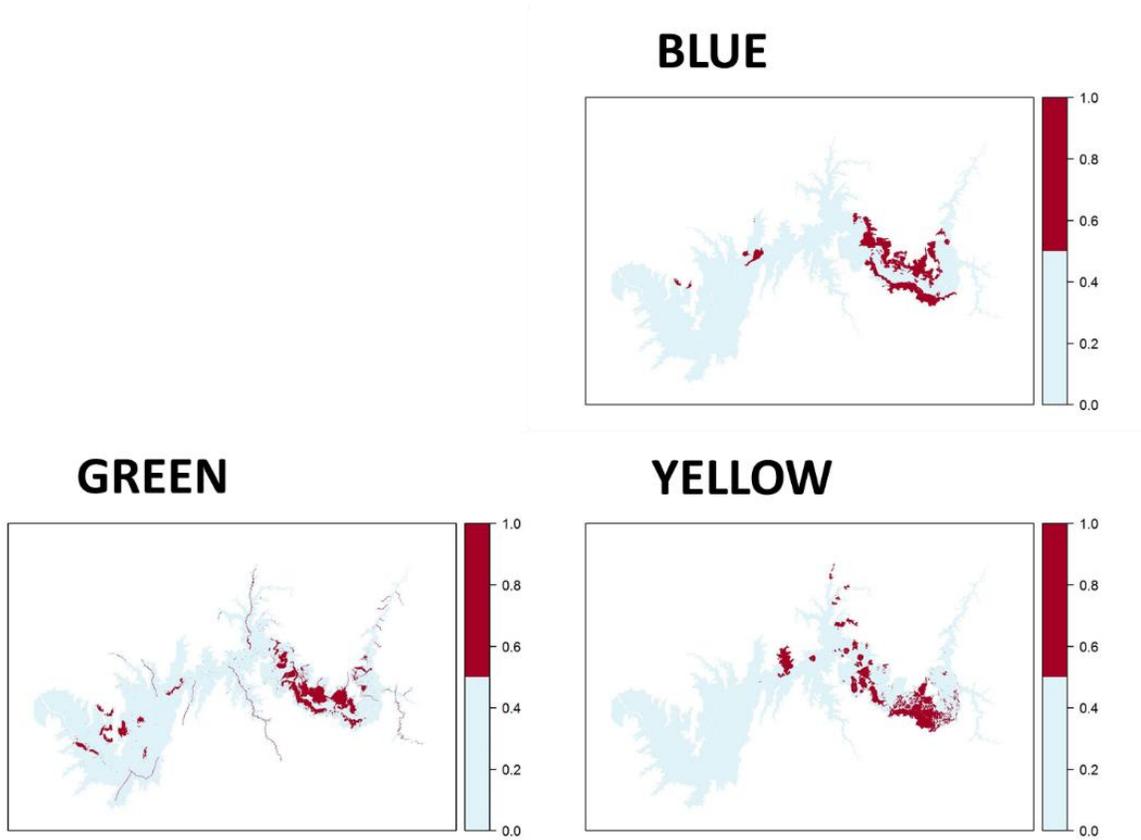
### GREEN



### YELLOW

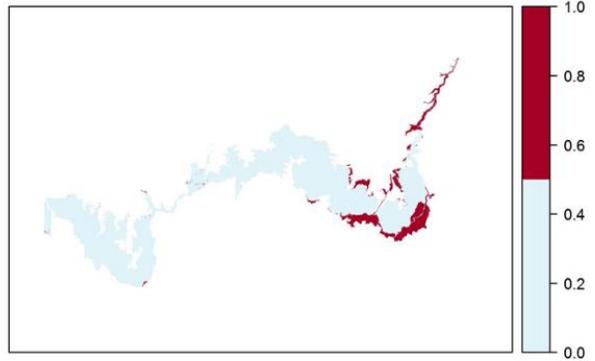


## Below the Rim Values Maps

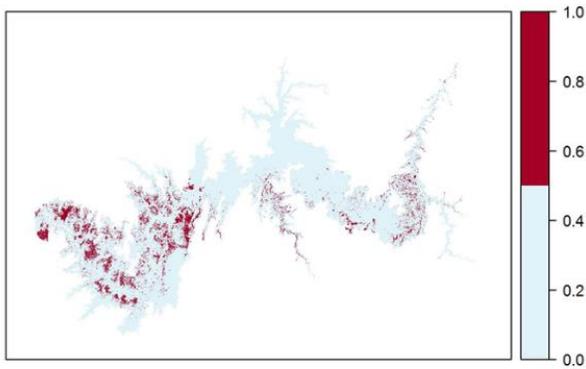


## Below the Rim Stressors Maps

### BLUE



### GREEN



### YELLOW

