VRS Part 1: Viewshed Science

- **Richard Smardon, professor emeritus, SUNY dept of environmental studies & landscape architecture**

- **Patrick Miller, FASLA, FCELA, professor emeritus, Virginia Tech dept of landscape architecture**

- **Brent Chamberlain, associate professor, dept of landscape architecture & environmental planning, Utah State**

Please note: These slides were shown as part of Scenic America's 2022 Scenic Symposium, Oct. 19-21, 2022, in Nashville, Tennessee. If you'd like to use this presentation for something other than personal viewing, please contact Scenic America at www.scenic.org/contact-us/. Video recordings of all conference sessions will be available sometime in late 2022 at www.scenic.org.

Up first:

Richard Smardon, professor emeritus, department of environmental studies & landscape architecture, State University of New York

Cultural Ecosystem Services as part of Scenic Resource Viewshed Management?

Richard "Rick" Smardon PhD

SUNY Distinguished Service Professor Emeritus at SUNY/ESF

Presented at the 2022 Scenic America Symposium

Nashville Tennessee October 20, 2022

Portions of this talk was previously presented at the 2017 Visual Resource Stewardship Conference

Cultural Ecosystem Services

- Presentation outline
  - Introduction to cultural ecosystem services & economic valuation
  - Cultural ecosystem assessment methods
  - Aesthetic assessment/valuation theory
  - Application of cultural ecosystem services accounting via a lake landscape viewshed

Cultural Ecosystem Services

- Classification & description (Millennium Ecosystems 2005)
  - *Aesthetic*- finding beauty or aesthetic value
  - *Recreation*- opportunities for recreation
  - *Education* – formal or informal education & training
  - *Spiritual/inspirational* –source of inspiration/religious attachment

Cultural Ecosystem Services

- From DeGroot et al 2002
  - *Informational functions*- providing opportunities for cognitive development

- From Faber et al 2005
  - *Cultural services* – enhancing emotional, psychological and cognitive well being

Cultural Ecosystem Services

● US EPA development of *Final Ecosystem Goods and Services Program (FEGS)* Ringold et al 2013 & Landers and Nahilk 2013 https://www.epa.gov/eco-research/final

  ● Includes linkage of ecosystem services to intermediate and final beneficiaries

  ● Includes a landscape classification for yielding ecosystem services, e. g. rivers & streams, wetlands, lakes & ponds, estuaries & near coastal, groundwater, forests, created green space, scrublands/shrublands, tundra, and atmosphere
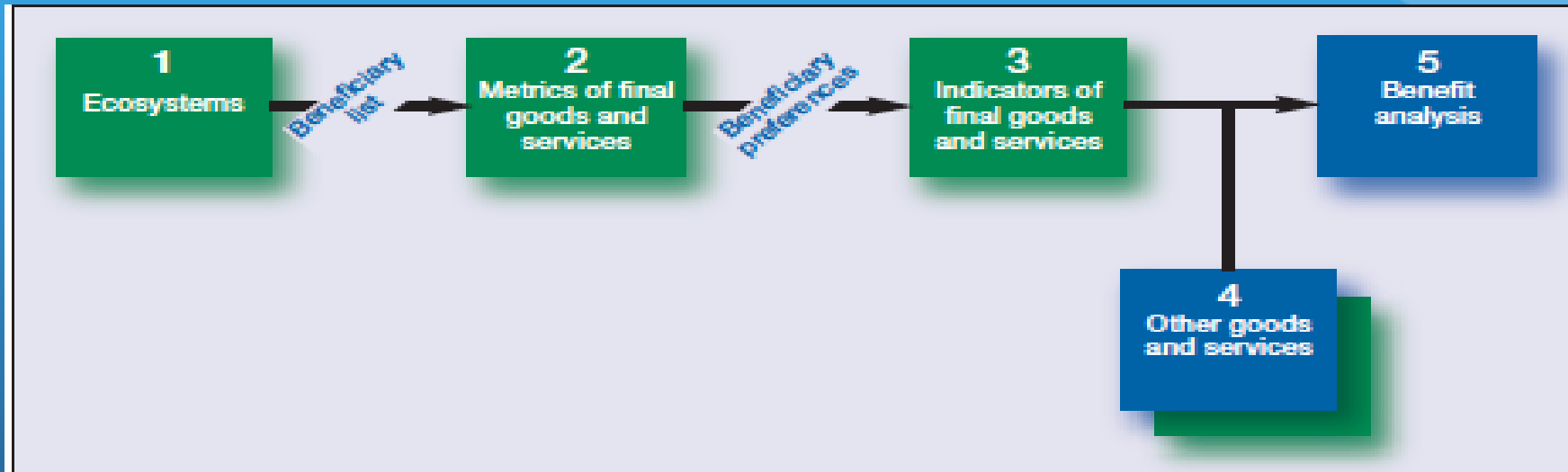
US EPA's conceptual frame

Figure 1. Conceptual relationship between ecosystems and benefits. Viewing ecosystems from the perspective of each category of beneficiary enables us to identify metrics of final services. Understanding beneficiary preferences allows us to combine metrics into indicators of final services. Indicators of final services, in combination with other information (eg complementary goods), support the analysis of benefits. Green is assigned to features that are biophysical, blue to human-based features; "Other goods and services" can be either biophysical or human-based features.

From Ringold et al 2013 What data should we collect? *Frontiers in Ecology and the Environment*

Benefits, final and intermediate services

BENEFIT	Final Services	Intermediate Components
Recreational angling	The water body The bass population The riparian forest	The water body's quality
Drinking water	The water body's quality	Wetlands, natural riparian land cover

Fig. 2—Ecosystem services for recreational angling vs. drinking water.

Economic valuation

● Traditional economic valuation applied to water/wetlands environments

  ● *Water recreation-* travel cost, hedonic and contingent valuation

  ● *Waterfront property* – hedonic analysis, market based appraisal

  ● *Water aesthetic views* – increase property value, hedonic models & willingness to pay

  ● *Water quality* – hedonic models, willingness to pay

Cultural Ecosystem Services

- Cultural ecosystem identification, assessment & valuation methods
  - Participatory community mapping (Brown 2012)
  - Internet based public participation & crowd sourcing (Orland 2017)
  - In depth interviews & mapping (Raymond 2009)
  - Group meetings/focus group, fieldwork & random questionnaire (Palmer and Smardon 1989)

Cultural Ecosystem Services

- Aesthetic value assessment theories (Zube et al 1982)
  - *Expert paradigm-* what Landscape Architect's do
  - *Psychophysical paradigm* –correlates stimulus/response relationship to landscape/seascape
  - *Cognitive paradigm-* attachment of meaning to landscape/seascape
  - *Experiential paradigm-* experience of being in or on the landscape/seascape
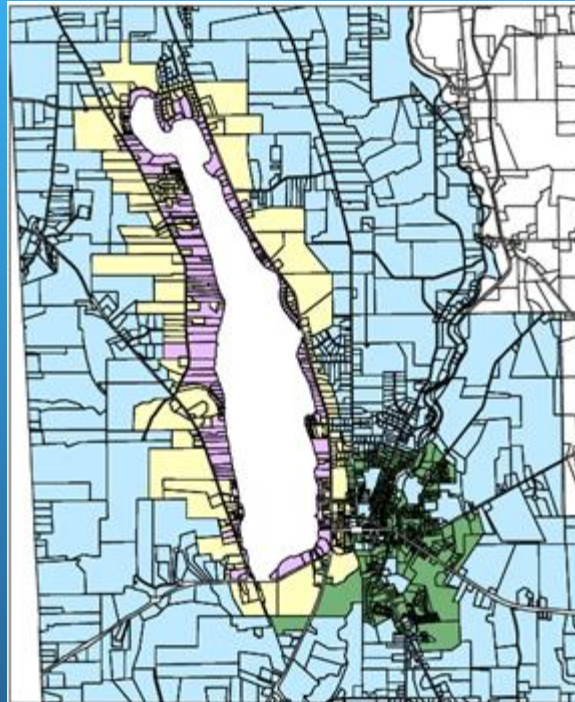
Case Study: Cazenovia Lake NY valuation

Case Study: Cazenovia Lake NY valuation

- Cazenovia Lake study scope
  - Quantify the value value stream of Cazenovia Lake to the village and town residents

- Study methods
  - Identify value stream categories & quantify as much as possible –travel cost, sales data, user's data, etc
  - Compare property value, taxation by lake edge, near lake, village and town properties=viewshed connection
  - Compare all of the above to property value and taxation to nearby town
  - Internet and on the ground questionnaire for respondent lake function knowledge, use frequency, and willing to pay

Cazenovia Lake
study zones for
comparison of
assessed
real estate values
and taxes
Note use of lake
viewshed to
determine zones

Enlargment

Tier 1: Lakefront Properties
Tier 2: Lake Influence Zone
Tier 3: Village Zone
Tier 4: Town Zone

Case Study: Cazenovia Lake NY valuation

- Lake value streams
    - Resource dependent business-marinas, restaurants
    - Recreational activities (cultural)- boating & swimming
    - Lake edge activities (cultural) –picnicking & bicycling
    - Inspirational activities (cultural) – lake edge weddings
    - Learning activities (cultural) – Lorenzo State park (historic)
    - Municipal operation/revenue- property value/taxes
    - Existence value (cultural) knowledge of the lake's value by residents and visitors

Case Study: Cazenovia Lake NY valuation

- Lake Value streams > ecosystem services
  - *Regulatory*- sediment retention, nutrient cycling and carbon storage
  - *Production*- water supply for some residents
  - *Support*- fish and wildlife habitat
  - *Cultural*- aesthetic, recreational, cultural, inspirational and education value streams identified before

Case Study: Cazenovia Lake NY valuation

- Specific visual/aesthetic resources
  - View from the center of the lake
  - View from Lorenzo State Park
  - Village center looking west toward the lake
  - Ridge road looking east toward the lake
  - View from US Route 20 driving east
  - Plus, all the activities listed as cultural ecosystem value streams with lake views and experiences

Case Study: Cazenovia Lake NY valuation

View from Lorenzo State Park

Case Study: Cazenovia Lake NY valuation

View from the village looking west

Case Study: Cazenovia Lake NY valuation

View from Route 20 looking Northeast

Cultural Ecosystem Services

- Discussion & Summary
  - Used mixed methods to quantify some ecosystem cultural service values plus tracking intangible benefit streams
  - Address overlapping nature of aesthetic recreation, education and inspirational services & values
  - Engage stakeholders via focus groups, surveys, workshops, PPGIS & social media to substantiate these services and values
  - Address the beneficiary relationships
  - End result= over $4 million in quantifiable benefits to entire Town of Cazenovia each year!

Cultural Ecosystem Services as part of Scenic Resource Management?

- Questions?

- Contact info for Richard " Rick" Smardon
  - rsmardon@esf.edu and smardon.richard0@gmail.com
  - Web sites http://www.esf.edu/faculty/smardon &
  - http://www.esf.edu/via
  - Also see Smardon R. 2021. Ecosystem Services for Scenic Quality Landscape Management, LAND 10:1123 https://doi.org/10.3390/land10111123 and
  - Gavitt J. M.2019. Calculating Cultural System Services as part of Greenspace Management, Journal of International Business Research and Marketing 4(4):16-21 http://dx.doi.org/10.18775/jibrm.1849-8558.2015.44.3002

Up next:

Patrick Miller, FASLA, FCELA, professor emeritus, department of landscape architecture, Virginia Tech

Deep Meaning in Visual Landscape Assessment

Patrick A. Miller, Ph.D., FASLA, FCELA
Professor Emeritus of Landscape Architecture
Landscape Architecture Program
Virginia Tech

Presented at:
Scenic America and Scenic Tennessee 2022 Scenic Symposium
The Personality of Place
Nashville, Tennessee
October 19-21, 2022

Where we are going

The work on Deep Meaning comes out of the Scenic Viewshed Project
  - I will be talking about that tomorrow

Today
- How we came across the idea of deep meaning
- How fit historically into visual management
  - A personal experience
  - Forest Service and BLM landscape architects
    - To successful?
    - Moving into an new area of scenic assessment
- Provide some non-landscape examples of deep meaning
- Deep meaning in the Virginia Viewshed Project
  - Public involvement and support

Acknowledgement

It is important to acknowledge that this study would never have taken place if it were not for Scenic Virginia and the hard work and dedication of the following individuals:

- Leighton Powell, Executive Director
  of SCENIC VIRGINIA

- Richard Gibbons FASLA, Landscape Architect
  DCR - Planning & Recreation Resources (retired)

- Lynn Crump, PLA, ASLA, Scenic Virginia

- Lisa Dickinson Mountcastle, President of Scenic Virginia

- Jisoo Sim, Ph.D. Graduate Research Assistant
  Landscape Architecture Program, Virginia Tech

Scenic Virginia Literature Review

Literature Review:

- 9 keyword search:
  - scenic value
  - scenic beauty
  - visual assessment
  - landscape preference
  - visual quality
  - scenic quality
  - visual resource management
  - landscape quality
  - landscape assessment.

Resulted in 853 citations from the years 1969 to 2018
- includes abstracts
- can be accessed at https://drive.google.com/file/d/1r0DSl3wkZjQw-iicP6ooaoDFFd_Y3OB9/view

A second literature database developed by Dr. Andrew Lothian was also consulted
- from his "Scenic Solutions Website"
- 1,854 publications from 1936 to 2014

Something Missing?

Test ideas and concepts from the literature review
- Use the Scenic Virginia Photo Contest Archive
- Result: something missing – not captured in the literature review concepts

An personal experience
- 1977 – BLM Range Improvements
- Socorro District, New Mexico
- Visual contrast rating
- Something did not seem right
- Bothered me for 40 years

Electric Well Pump

Windmill

Was there a Deeper Meaning?

- Does a windmill, as a content of the landscape, convey a deeper meaning?
  - Does it stimulate thought?
    - About the history of the West
  - Does it have a poetic meaning?
  - Let's use a wine example

Typical bottle of wine

An more poetic presentation

Keswick Panorama in the Lakes District of Northern England - Location
of William Wordsworth's traveler's guidebook to England's Lake District

I Wandered Lonely as a Cloud
by William Wordsworth

I wandered lonely as a cloud
That floats on high o'er vales and hills,
When all at once I saw a crowd,
A host, of golden daffodils;
Beside the lake, beneath the trees,
Fluttering and dancing in the breeze.

Continuous as the stars that shine
And twinkle on the milky way,
They stretched in never-ending line
Along the margin of a bay:
Ten thousand saw I at a glance,
Tossing their heads in sprightly dance.

The waves beside them danced; but they
Out-did the sparkling waves in glee:
A poet could not but be gay,
In such a jocund company:
I gazed—and gazed—but little thought
What wealth the show to me had brought:

For oft, when on my couch I lie
In vacant or in pensive mood,
They flash upon that inward eye
Which is the bliss of solitude;
And then my heart with pleasure fills,
And dances with the daffodils.

Time for Change?

Should landscape content that conveys deeper meaning be included in the Virginia Viewshed Assessment?

- More personal meaning - local citizen support

- More poetic meaning – conveys sense of place

- Different purpose than large scale public lands

  - Not for mitigation of resource extraction

  - For preservation of scenic quality of an place

- Smardon notes, "After the 1980's there has been little new work in visual resources assessment methodologies aside from developing visual simulation digital technology"

How Deeper Meaning is Part of Virginia Viewshed Assessment

Viewsheds to be nominated and named by local citizens

- Poetic and personal viewshed names encouraged
- Guidance in writing deeper more poetic viewshed descriptions (examples provided)

Assessment by people familiar with assessment procedure

- assessment of the following landscape content
  - Scenic value of historic resources
  - Scenic value of human-influenced landscapes
    - Cultural content landscapes
    - Urban content landscapes
  - Scenic value of ephemeral qualities

Historic Content Viewsheds

Cultural Content Viewsheds

Urban Content Viewsheds

Ephemeral Quality Viewsheds

Scenic Quality Protocol

Part 1: Viewshed Scenic Quality

VIEWSHED SCENIC QUALITY	HIGH	MODERATE	LOW
1. Viewshed Size *How wide is the view?*	panoramic [a] 3	medium view [b] (2)	limited view [c] 1
2.Variety and Visual Complexity *How much variation in the visual charateistics of the landscape (patterns, color, form, line and textures)?*	High 2	Moderate (1)	Low 0
3. Coherence and Legibility *How the visual composition fits together, and is distinct and memorable?*	High 2	Moderate (1)	low 0
4. Natural Condition *How natural or undeveloped is the viewshed?*	natural/ undeveloped 2	scattered developed [d] (1)	developed 0
5. Ephemeral qualities in foreground and middle ground *Are ephemeral qualities a common content of the viewshed?*	frequent/ predictable (2)	not frequent but predictable 1	not predictable 0
4. Positive human-influenced content in the viewshed *viewshed?*	Visually Striking 2	Noticeable but not visually striking 1	Not visible 0

	TOTAL SCORE		
	CLASS	H: 11 ~ 7	M: 6 ~ 3	L: 2 ~ -1

a. wide view and includes all distance zones
b. includes at least two distance, but not wide
c. one distance zone and narrow
d. scattered developed, but surordinate to natural characteristics of the landscape
e. visible, but surbordinate to visual elements and characteristics of the landscape

Pilot test procedure

- In a few communities this year.

- Is the procedure understandable?

- Does it produce consistent results?

Elwood Shafers's Model

$Y = 184.8 - 0.5436X_1 - 0.09298X_2 + 0.002069(X_1 \cdot X_3)$

$+ 0.0005538(X_1 \cdot X_4) - 0.002596(X_2 \cdot X_3) + 0.001634(X_2 \cdot X_4)$

$0.0008441(X_2 \cdot X_6) - 0.0004131(X_3 \cdot X_5) + 0.0006666X_5^2 + 0.0001327X_5$

where Y = preference score - the lower the score, the more preferred the scene;

X, = perimeter of immediate vegetation - section of the photo where characteristics of individual leaves, bark of trees and shrubs (not grass) are easily distinguishable;

X2 = perimeter of intermediate nonvegetation - section of the photo where prominent features of nonvegetation (including grass) are visible, but not in the fine detail found in immediate zone;

X, = perimeter of distant vegetation - section of the photo where only the broad outline of shapes of vegetation are distinguishable, but no details are visible;

X, = area of intermediate vegetation - section of the photo where vegetation is visible but not in fine detail found in the immediate vegetation zone;

X, = area of any kind of water - section of photo that includes water;

X6 = area of distant nonvegetation - section of the photo where shapes of nonvegetation cannot be distinguished.
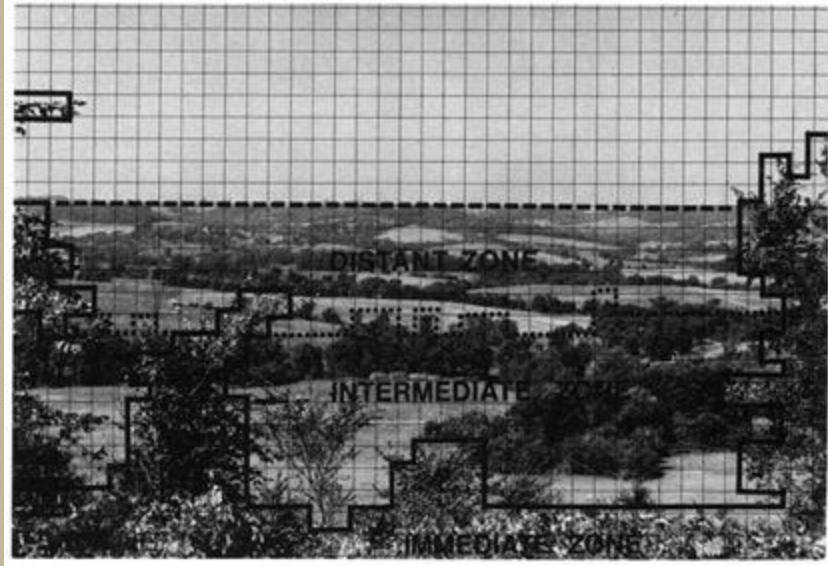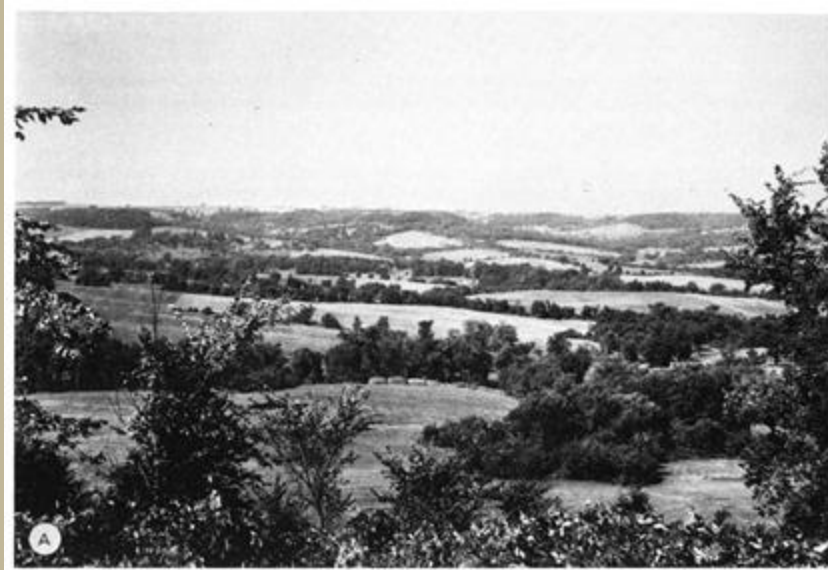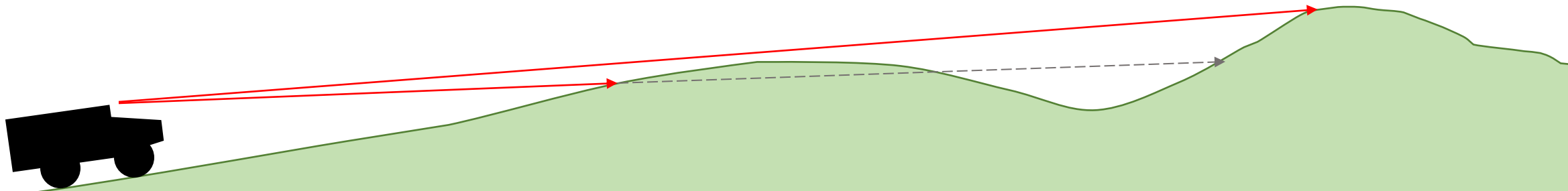
Thank you

Up next:

Brent Chamberlain, associate professor, department of landscape architecture & environmental planning, Utah State University

Finding Scenic Routes with GRAVIA

Brent Chamberlain, Ph.D.
Utah State University
Landscape Architecture and Environmental Planning
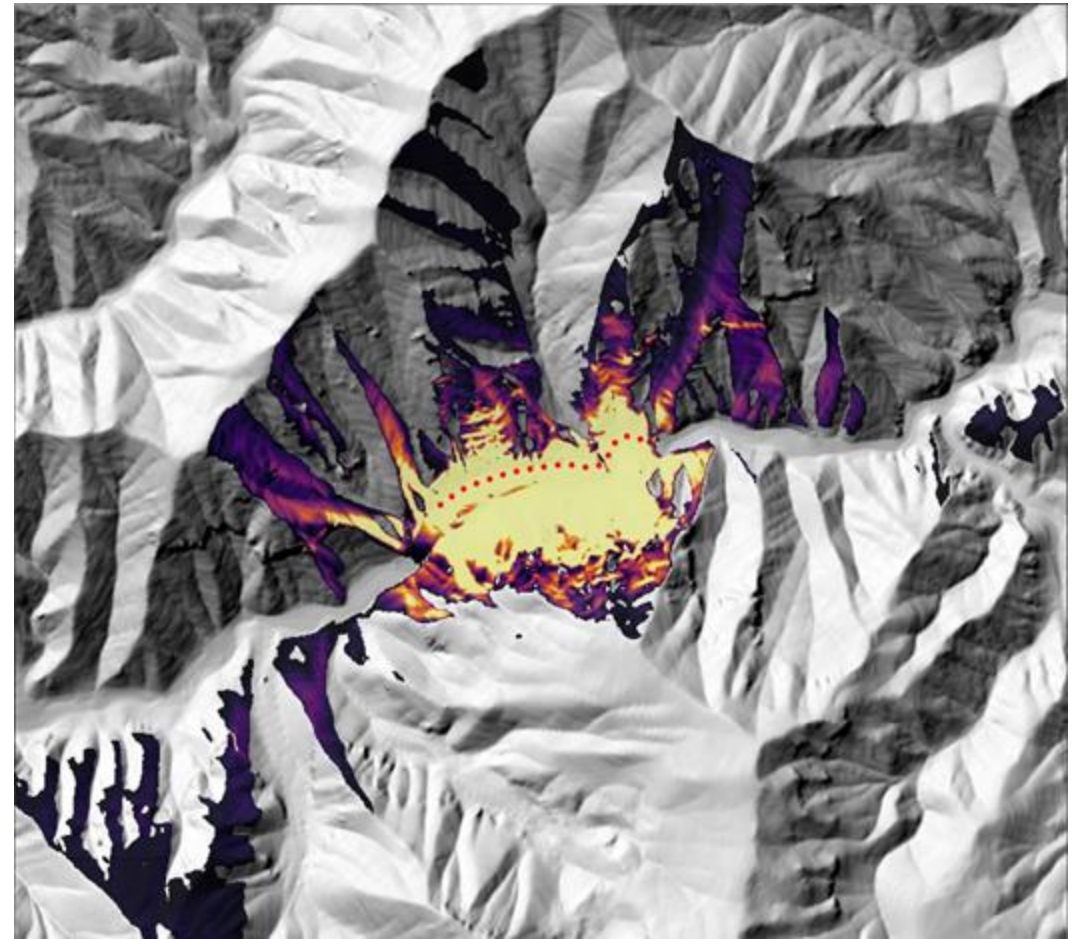Scenic America Board Member Since 2021

Viewshed

Viewshed

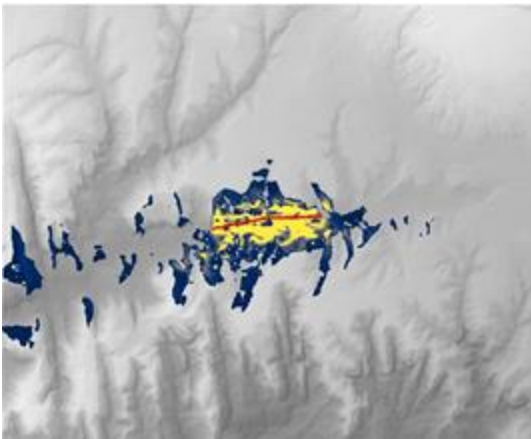# GRAVIA (Geospatial Route Analysis and Visual Impact Assessment)

Why do we need it & Does it work?

Empirical evaluation of GRAVIA

Premise

How do we compare 5,000 miles of highway?

OR

Study Questions

General

1)   Can GRAVIA inform us which scenic byways or other roadway environments contain the best experience for vehicle-based viewers?
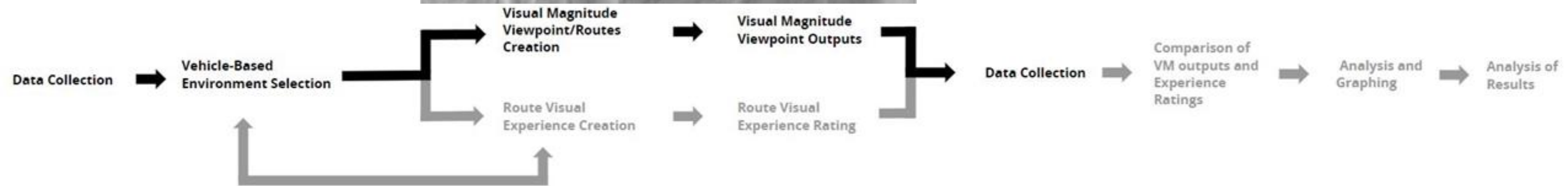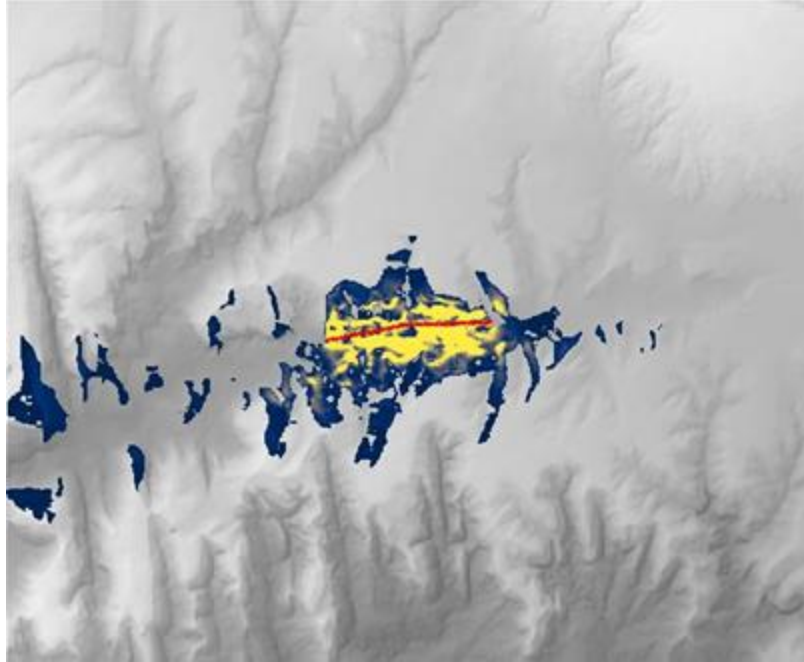
Specific

 2) To what extent does GRAVIA correlate to public scenic ratings of highway experiences?
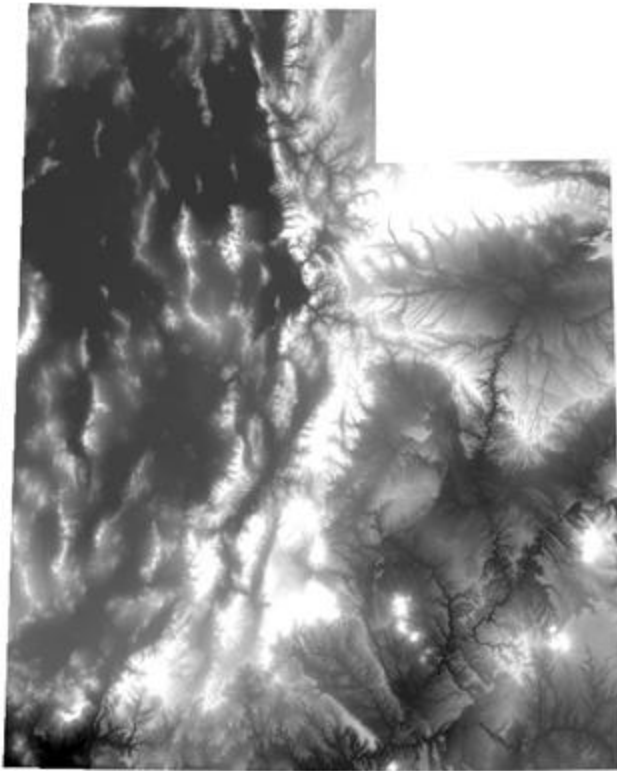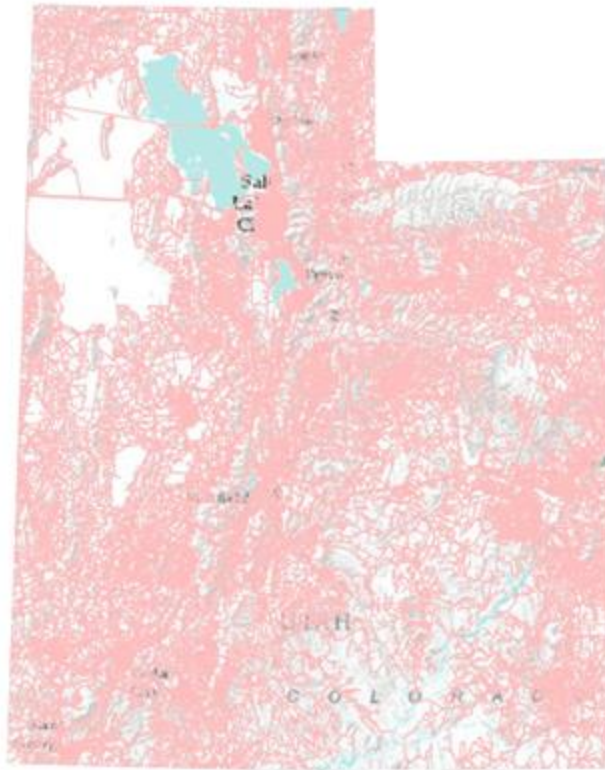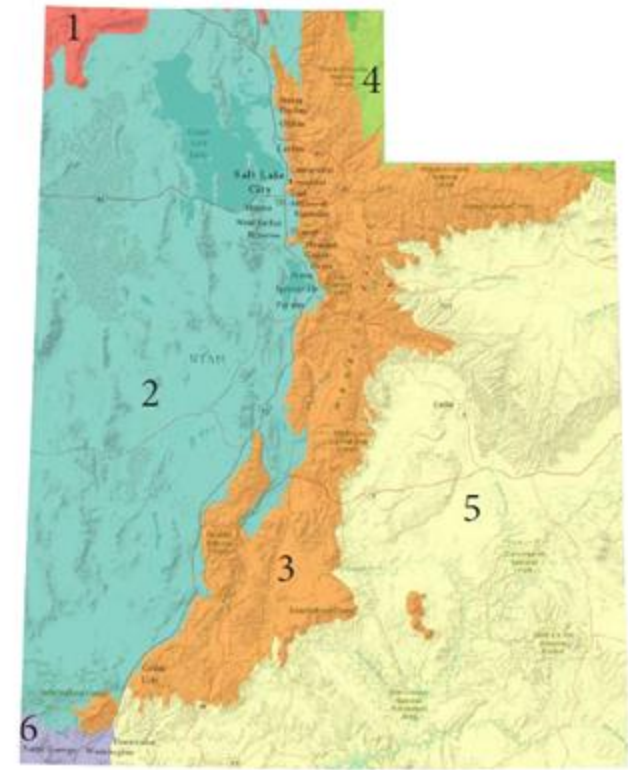
Methodology
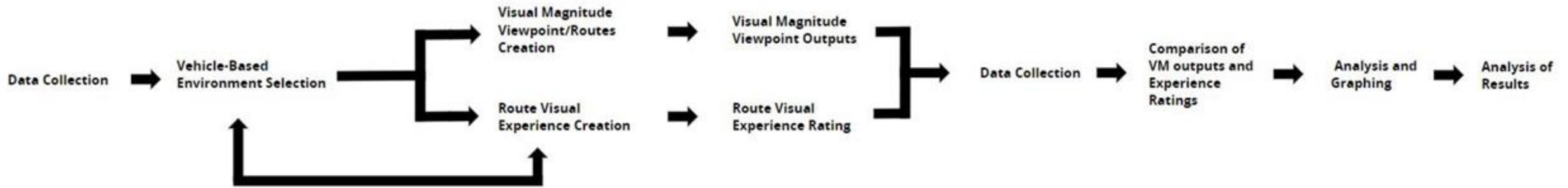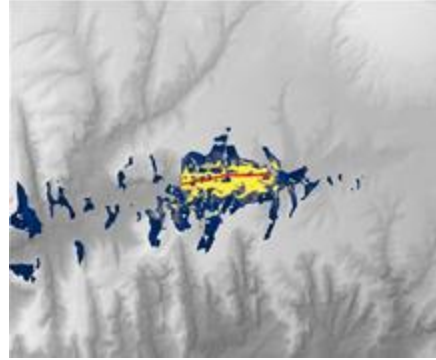
Methodology

Data Collection → **Vehicle-Based Environment Selection** → **Visual Magnitude Viewpoint/Routes Creation** → **Visual Magnitude Viewpoint Outputs** → **Data Collection** → Comparison of VM outputs and Experience Ratings → Analysis and Graphing → Analysis of Results

Route Visual Experience Creation → Route Visual Experience Rating

Data Collection

Data Collection → Vehicle-Based Environment Selection → Visual Magnitude Viewpoints/Routes Creation → Visual Magnitude Viewpoint Outputs → Data Collection → Comparison of VM outputs and Experience Ratings → Analysis and Graphing → Analysis of Results

Route Visual Experience Creation → Route Visual Experience Rating

10 Meter DEM   Utah Roadway Data   Level 3 Ecoregions of Utah

# Route Selection

Criteria for Selection

1. Selection of route length will be kept to **ONE mile in length**

2. Selected roadways will be **TWO driving lanes in width**

3. Selected environments will either be **Rural Development or Natural Environments**

4. Roadways must be within the state of Utah

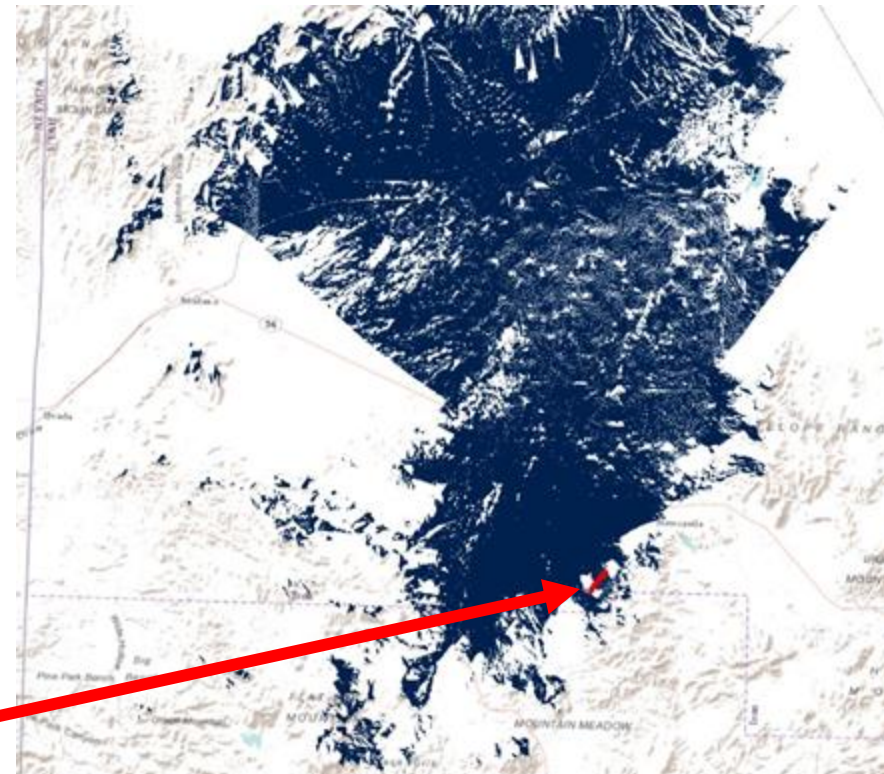5. **Speed limit between 50 and 60 MPH**

6. **Variety** of scenic qualities
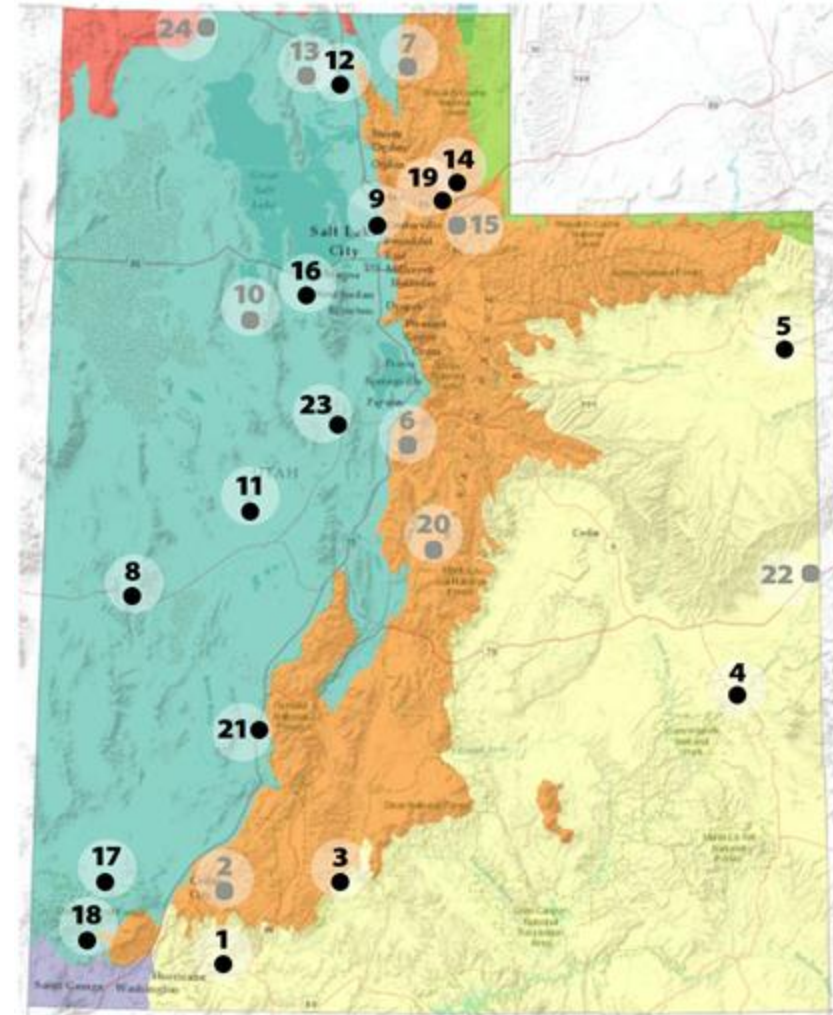
Route Environments
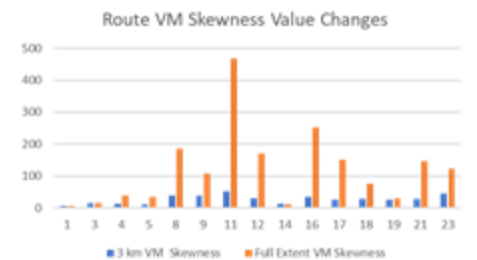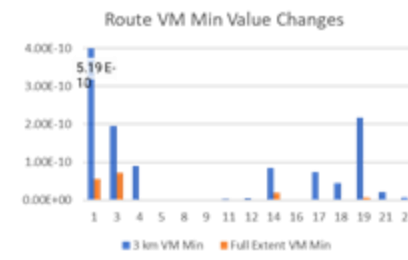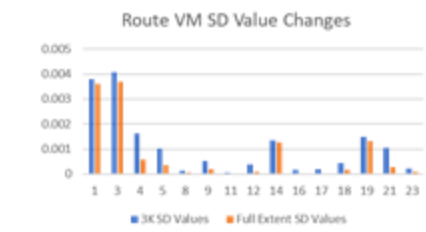

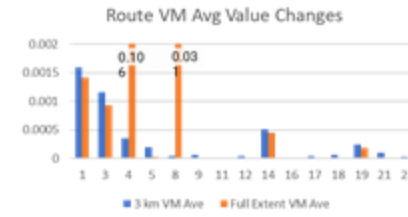Environmental Differences
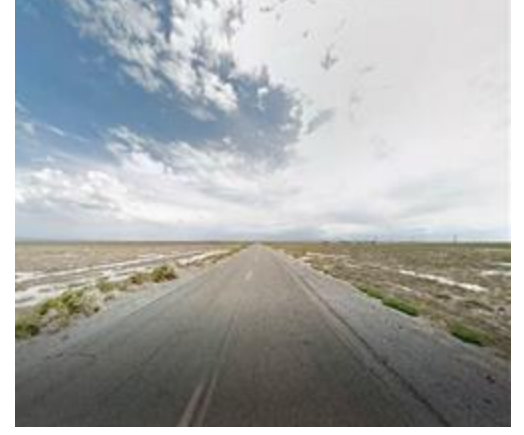
GRAVIA @ Sites

1 mile segment

Results

Methodology

Study Process

Video Experiences

Road 3 Average Scenic Rating – 7.98

Road 11 Average Scenic Rating – 3.31

Google Street View Images
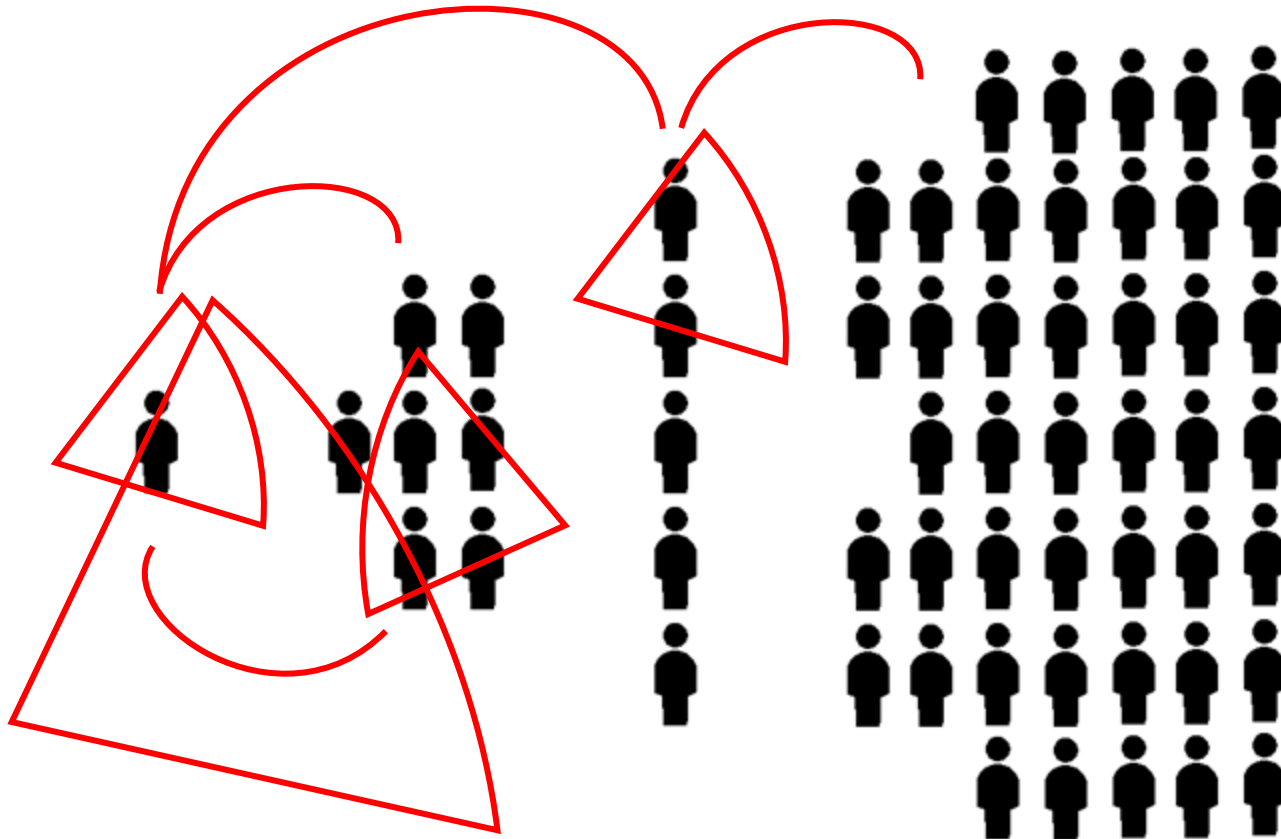
Study Process

Survey - Distribution

Distributed via department administrators
- Total of 49 responses
- 44 responses kept as viable

Results

Pearson Correlation of Full Extent VM and Avg Scenic Ratings

R² = 0.0311

Pearson Correlation of 3 Km VM and Avg Scenic Ratings

Average Visual Magnitude

Pearson Correlation Full Extent SD and Scenic Ratings

R² = 0.5727

Correla...
p Value...

Correlation: 0.631
p Value: .011

Can predict...

Pearson Coefficient of Skewness for 3 Km Area

R² = 0.2091

Visual Magnitude Skewness

Correlation: 0.61
p Value: .015

Correlation: 0.457
p Value: .086

Visual Magnitude Standard Deviation

Correlation: 0.785
p Value: .0005

Study Questions

General

1) Can the visual magnitude tool inform us which scenic byways or other roadway environments contain the best experience for vehicle-based viewers?

Answer: Yes, it can because of the strength of the relationships shown between GRAVIA (standard deviation especially) and scenic quality ratings.

Specific

2) To what extent can the visual magnitude tools output correlate to public scenic ratings of highway experiences?

Answer: Our values show a strong correlation between the visual magnitude values and scenic quality ratings and the initial extent of that relationship seems strong.

Implications

- GRAVIA can be ran over large areas, long routes and with high detail

- Topography may have a significant influence on the how people rate scenery

- Could streamline identification of how development could impact ratings

- **GRAVIA is empirically tested, can be used in key visual inventory processes to interpret how people feel about the scenic quality of rural and natural landscapes (at least in Utah)**
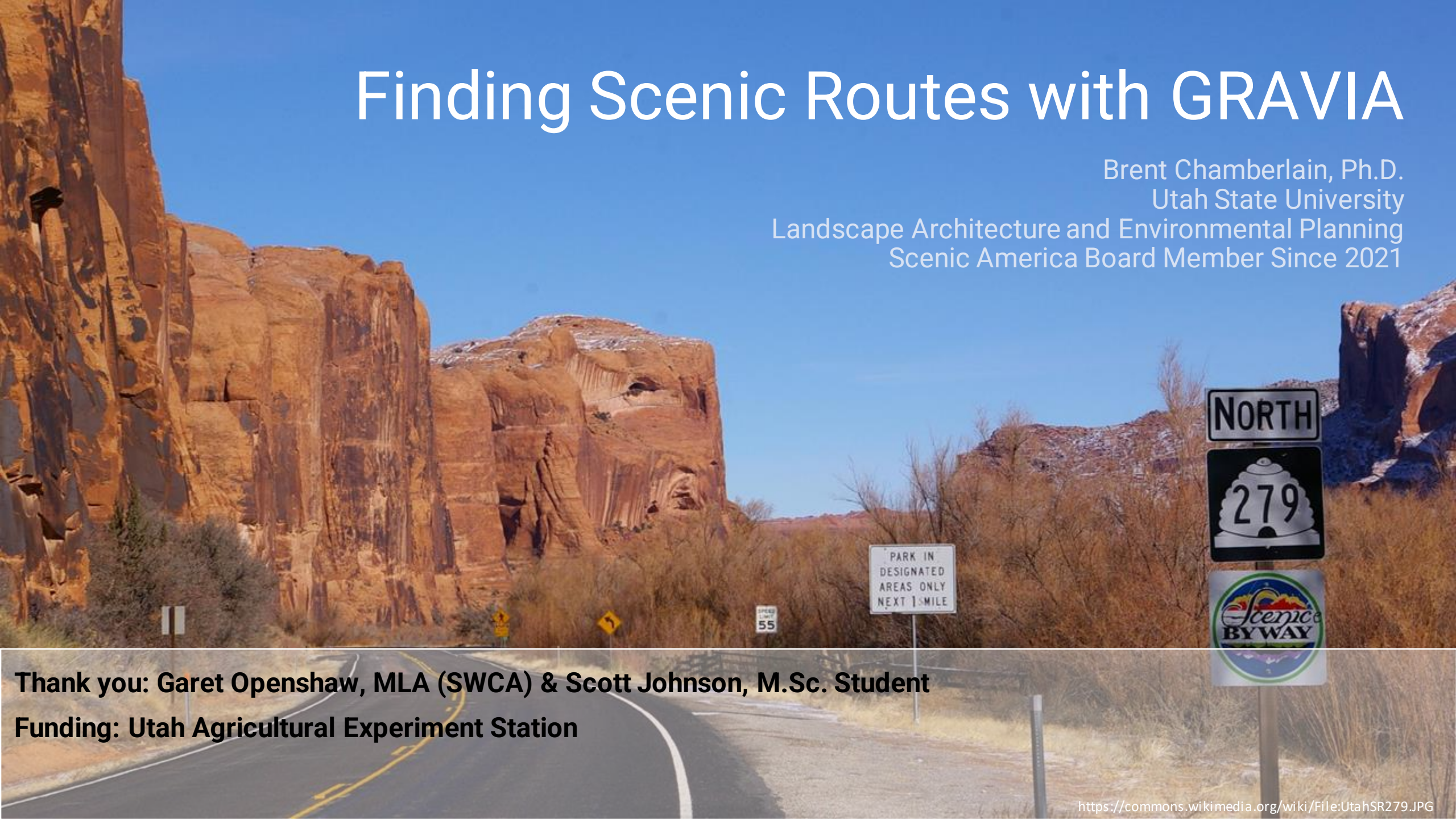

https://commons.wikimedia.org/wiki/File:2012.09.30.151456_Indian_Summer_US89_Chokecherry_Area_Logan_Utah.jpg

Finding Scenic Routes with GRAVIA

Brent Chamberlain, Ph.D.
Utah State University
Landscape Architecture and Environmental Planning
Scenic America Board Member Since 2021

Thank you: Garet Openshaw, MLA (SWCA) & Scott Johnson, M.Sc. Student

Funding: Utah Agricultural Experiment Station

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