A suspension bridge with a metal railing spans a rocky gap in a forested mountain range. The bridge is supported by two tall metal towers. The surrounding landscape is rugged, with large rocks and dense evergreen trees. The background shows a hazy, forested mountain range under a soft, golden light.

Bridging the Gap:

a study of openings in the forest canopy and their contribution to structural diversity and early successional habitat

Carly Lewis, Sheryl Bryan,
Jason Rodrigue, & Gary Kauffman
National Forests in North Carolina



What is a gap?

... a break in the forest canopy, created through natural or man-made disturbance, that influences the structure and function of the surrounding environment...



Function is a matter of scale...

Smaller openings (e.g. single and multiple tree fall gaps):

- Create light pockets and affect local habitat conditions
- Facilitate structural diversity within the surrounding forest

Larger openings (e.g. larger natural and most man-made disturbances):

- Facilitate early successional habitat and young forest conditions to varying degrees, depending on size, location, and vegetative composition
- Edge/open area ratio and vegetative composition are critical to a gap's effectiveness as early successional habitat
- ESH/YF habitat needs vary by species

Two gappy “take-homes”:

- Most (but not all) animal species require more than one habitat condition, and are associated with early successional habitats for at least part of their life history.
- One gap size does not fit all...



Identifying Canopy Gaps

1. From LiDAR:

- Identify pixels where: Canopy Cover = 0-25% AND Tree Height = 0-15 feet AND Shrub Density <50%.
- Aggregate function to reduce extreme data patchiness
- Identify gap patches using 8-pixel neighbor grouping (i.e. two pixels touching any side/corner = same patch)

2. Convert raster patches to polygons; intersect with PNV to assign ecozone

3. Give a VERY LARGE shout out to Carly Lewis from the Lolo National Forest and Mark Endries from the USFWS Asheville Field Office for their help on this effort!

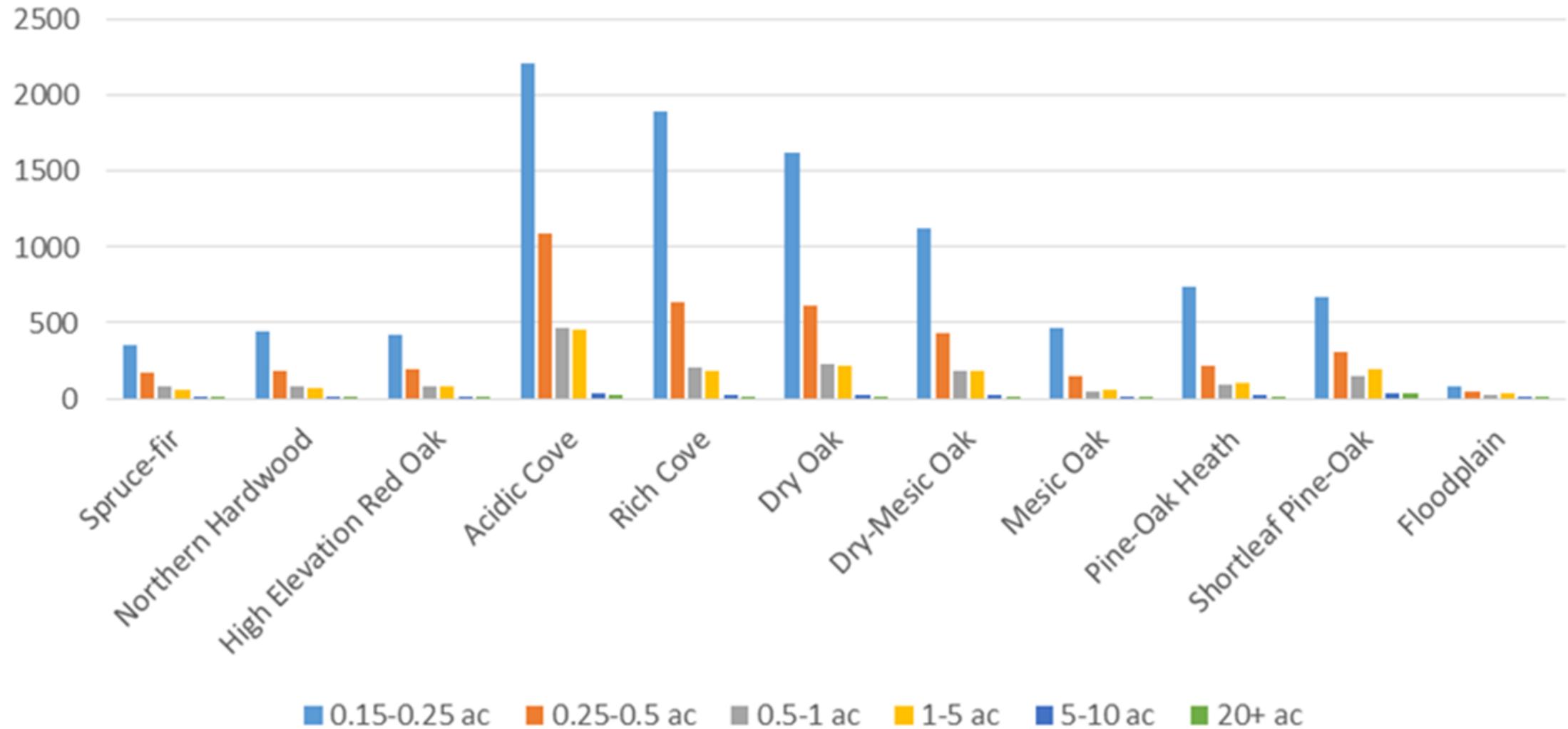


From spatial
analysis padawan...

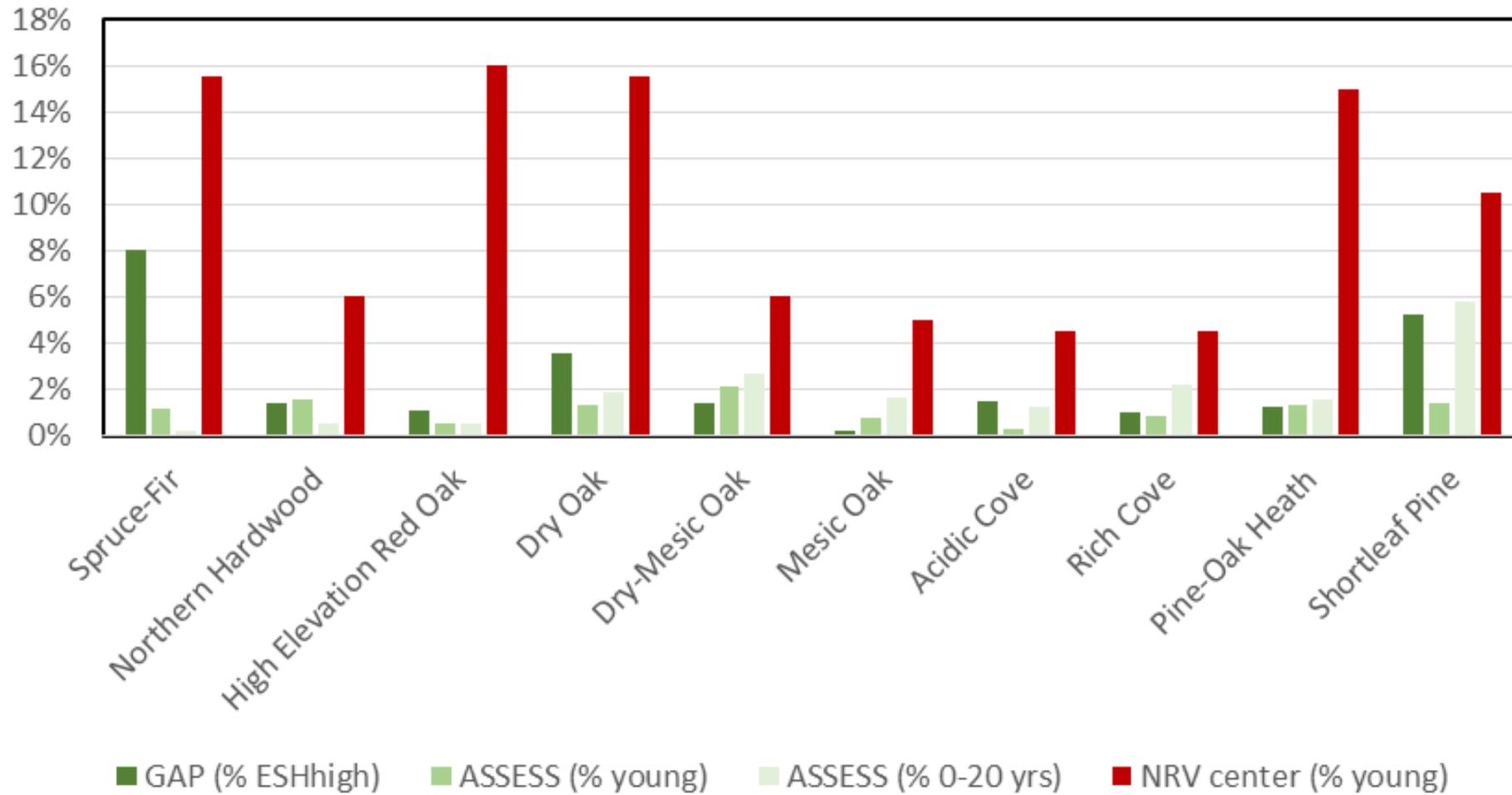
...to raster
Jedi master.

TO DO: (1) Evaluate utility of ESHmod and ESHlow because of a diversity of opinion on YF/ESH composition and (2) re-evaluate recently discovered overlaps in the last two data queries (we're working on this right now)

Figure 4. Number of patches of each size class amongst the different ecozones on the Nantahala-Pisgah Forests



Contributions of existing YF/ESH to estimated NRV



GAP SUMMARY (acres)					
	Total	Min	Max	Mean	% NP*
all	12,353.20	0.15	746.52	0.72	1.46%
> 0.15 ac	9,872.69	0.29	746.52	1.47	1.17%
treefall gaps	2,480.51	0.15	0.29	N/A	0.29%

*includes Phase III LiDar area only

GAP+ESHmod SUMMARY (acres)		
	Total	% NP*
all	36,229.81	4.29%
> 0.15 ac	28,720.35	3.40%
treefall gaps	7,509.46	0.89%



Keeping in mind...

- Each of the models and data sets used in this analysis has strengths and weaknesses and is based on assumptions. Sometimes “assumption math” does not follow conventional mathematics (i.e. assumptions may be related to each other in ways other than directly cumulative).
We need to be in our comfort zone with these assumptions.
- These results are estimates based on the best available data, and should be subject to revision (i.e. post plan revision) as newer/better data becomes available (e.g. 2017 LiDar data).
- There is room for refinement (e.g. include ESHmod and NRVopen?).
This process is repeatable.
- Nothing should take the place of boots on the ground to confirm site-specific project conditions and assessment of project contributions to overall landscape-level conditions.



Some parting thoughts...

- Enhances our ability to the restore landscape mosaic, including doing a better job of incorporating all lands
- Highlights our ability to look at effects of natural and anthropogenic disturbances on YF/ESH and other structural conditions
- Lessons from *Greenburg and Collins*:
 - *Shift in management perspective*
 - *Emulate effects of natural disturbance*
 - *Address long-range environmental challenges*
 - *Keeping it realistic*



THERE IS NO
“I” IN TEAM:
*developing
guidance for
western North
Carolina’s public
lands through
leadership and
collaboration*



QUESTIONS?

<https://www.fs.usda.gov/main/nfsnc/landmanagement/planning>
(Nantahala-Pisgah Plan Revision)

