Random cheese update

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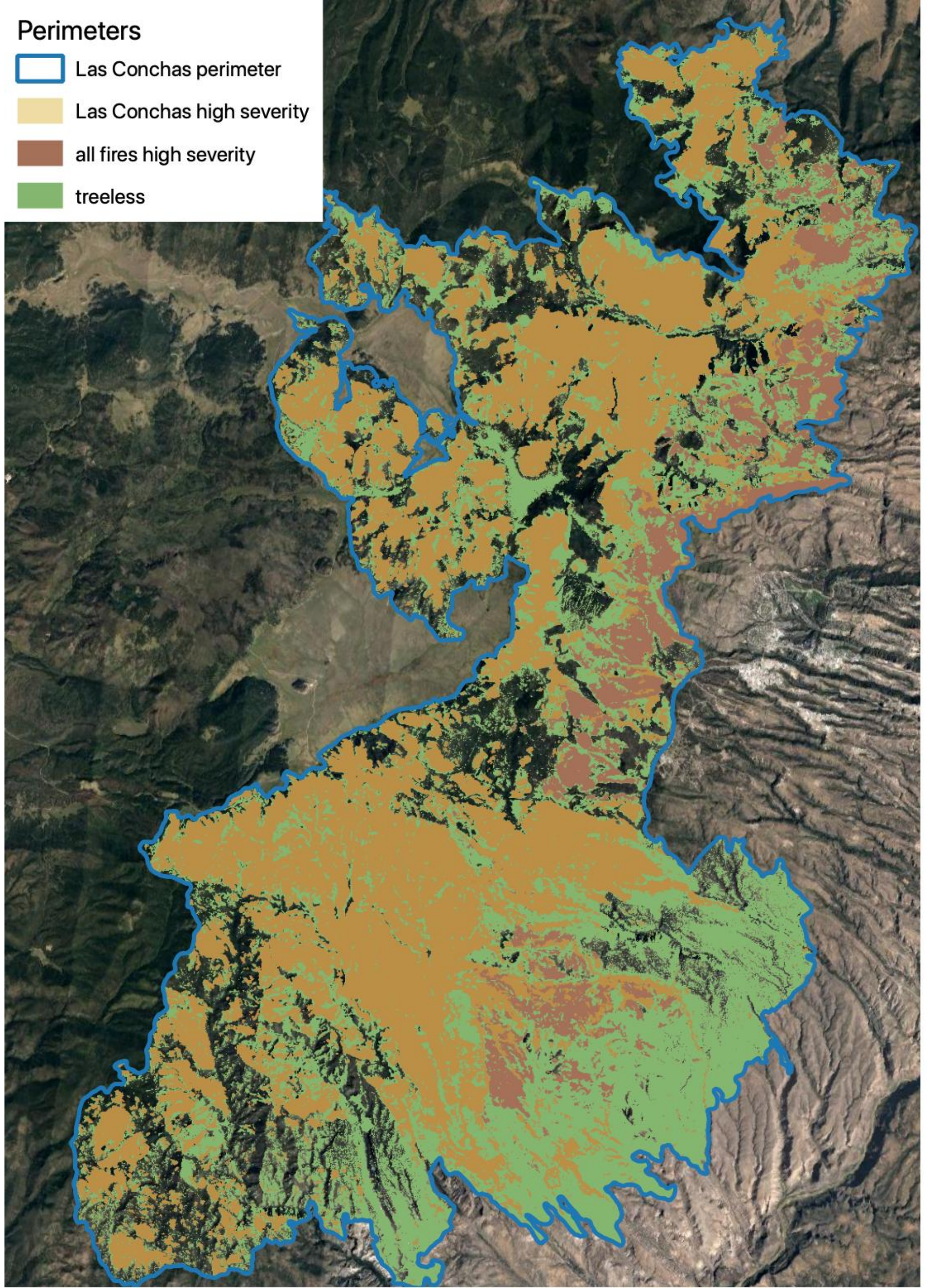
February 18 2021

Things to talk about

1. Severity layers
2. Processing severity layers
3. Patch distributions: simulating reality
4. Scar intersection analysis

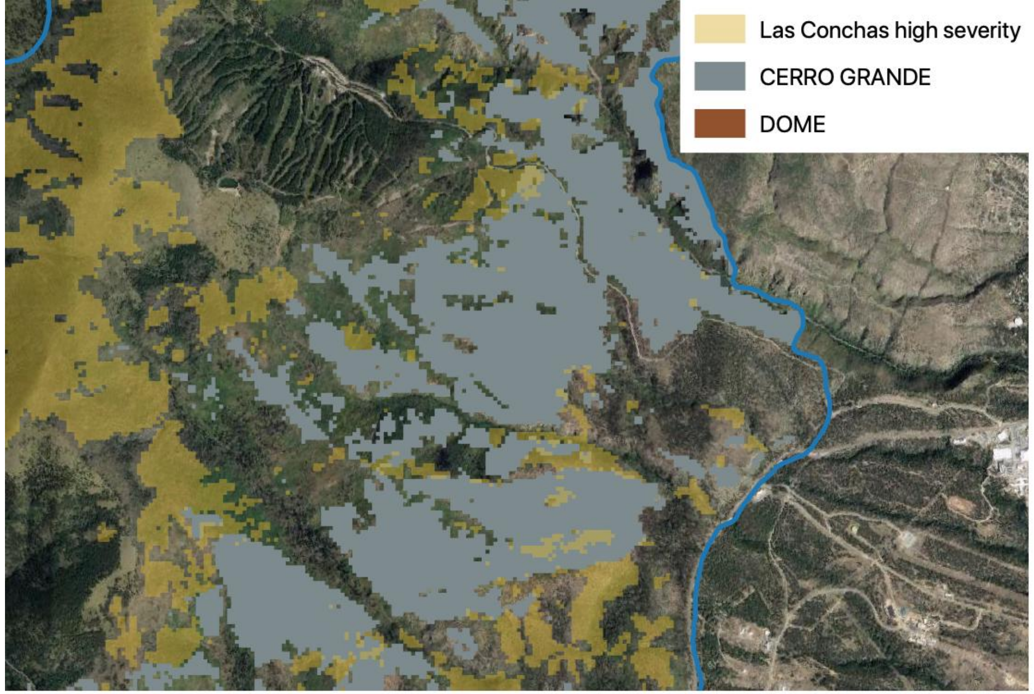
1: severity layers

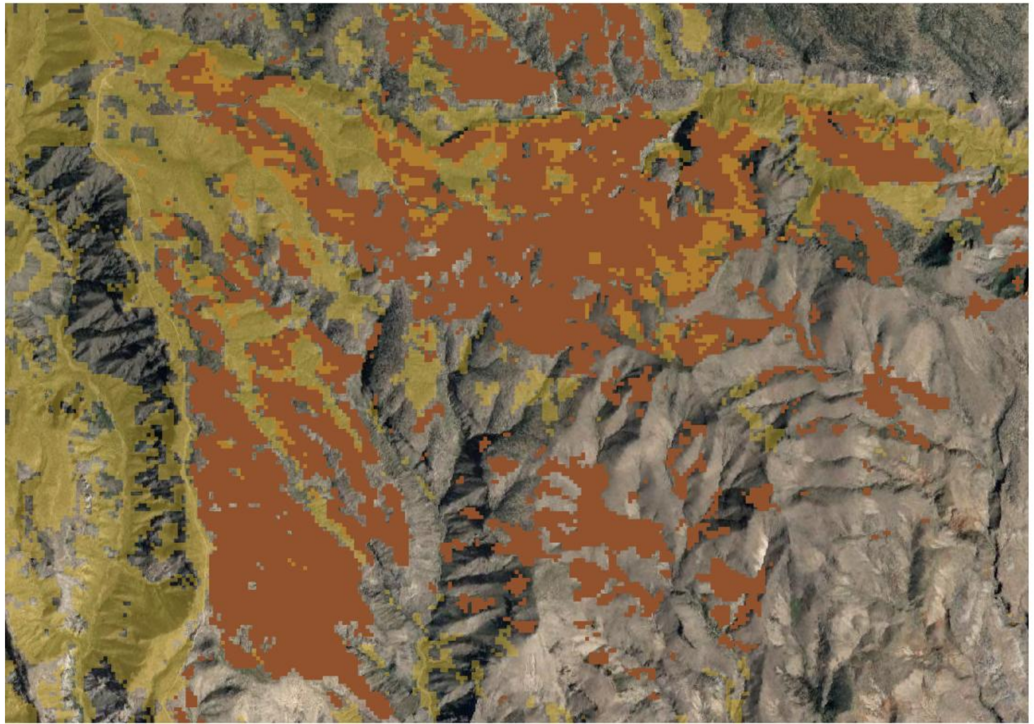
- Sean developed "Las Conchas" and "all fires" (using all intersecting perimeters).
  - 30 m resolution, "predicted CBI" following Parks et al. 2019
  - "all fires" includes LC plus other fires with >10 ha intersecting high severity
    - Dome ('96) 1253 ha; Oso ('98) 605 ha; Cerro Grande ('00) 2789 ha
- Coop "treeless" layer is most expansive



1: severity layers - issues

- 3 scenarios: lc, all, treeless
  - Goal is to bracket “reality”
  - The CBI method means the “lc” layer does not capture re-burned high-severity well (see examples)
- True reality probably lies between “all” and “treeless”

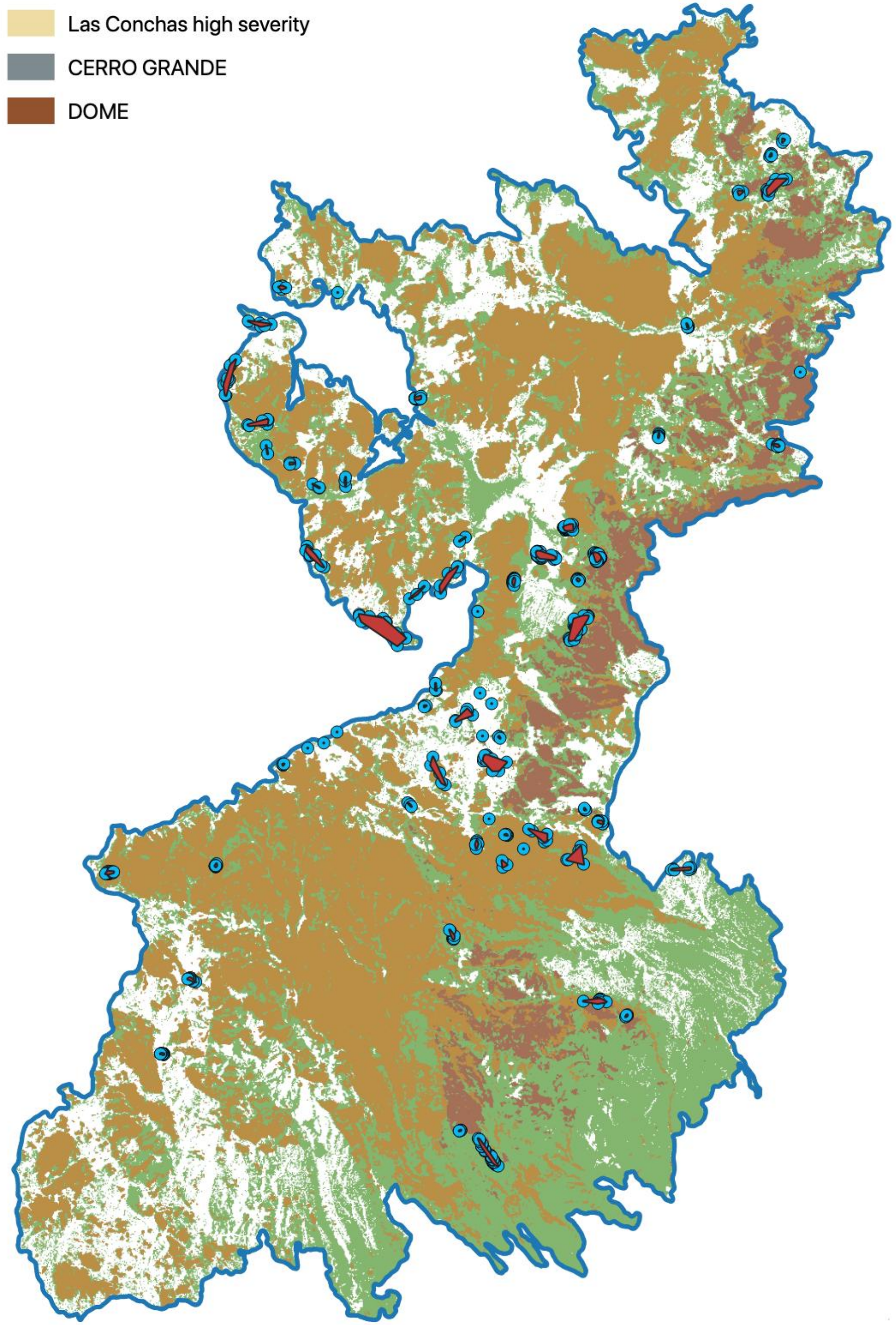




1: severity layers - stats

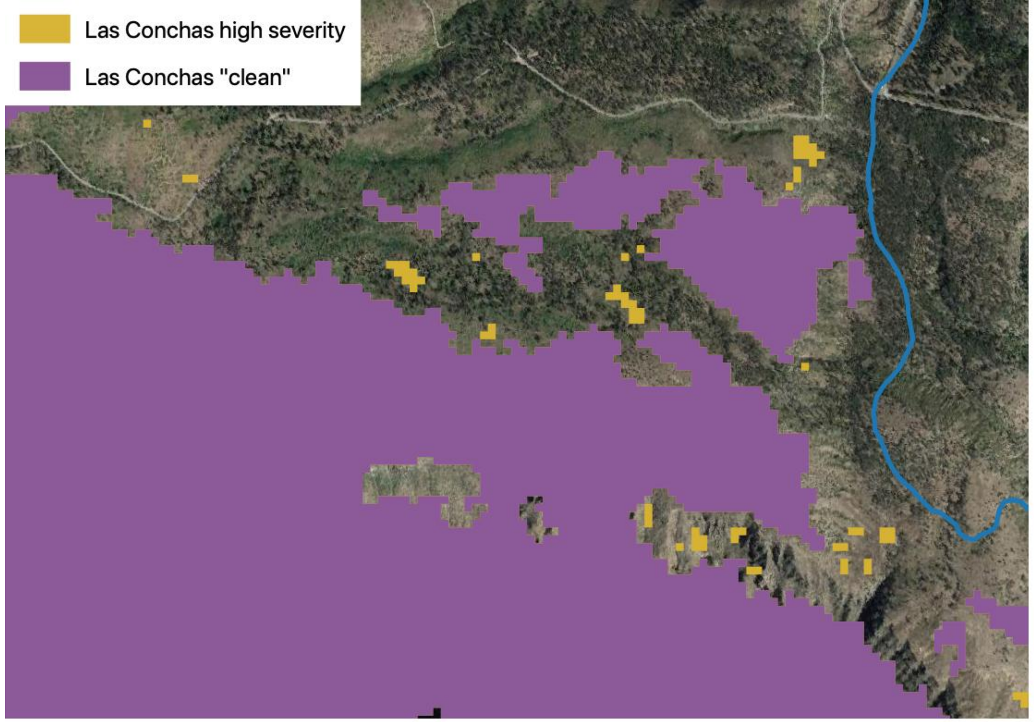
- 3 scenarios: lc, all, treeless

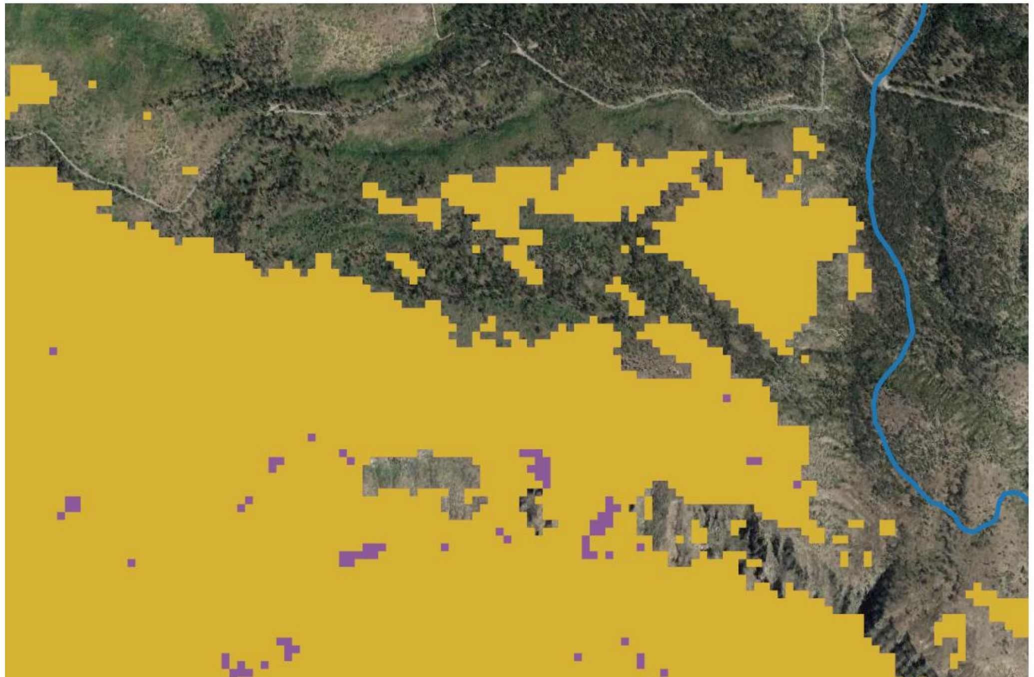
Scenario	% HS	% scars overlapped	% clusters overlapped
lc	35.4%		
all	42.8%		
treeless	65.5%		



2: processing severity layers

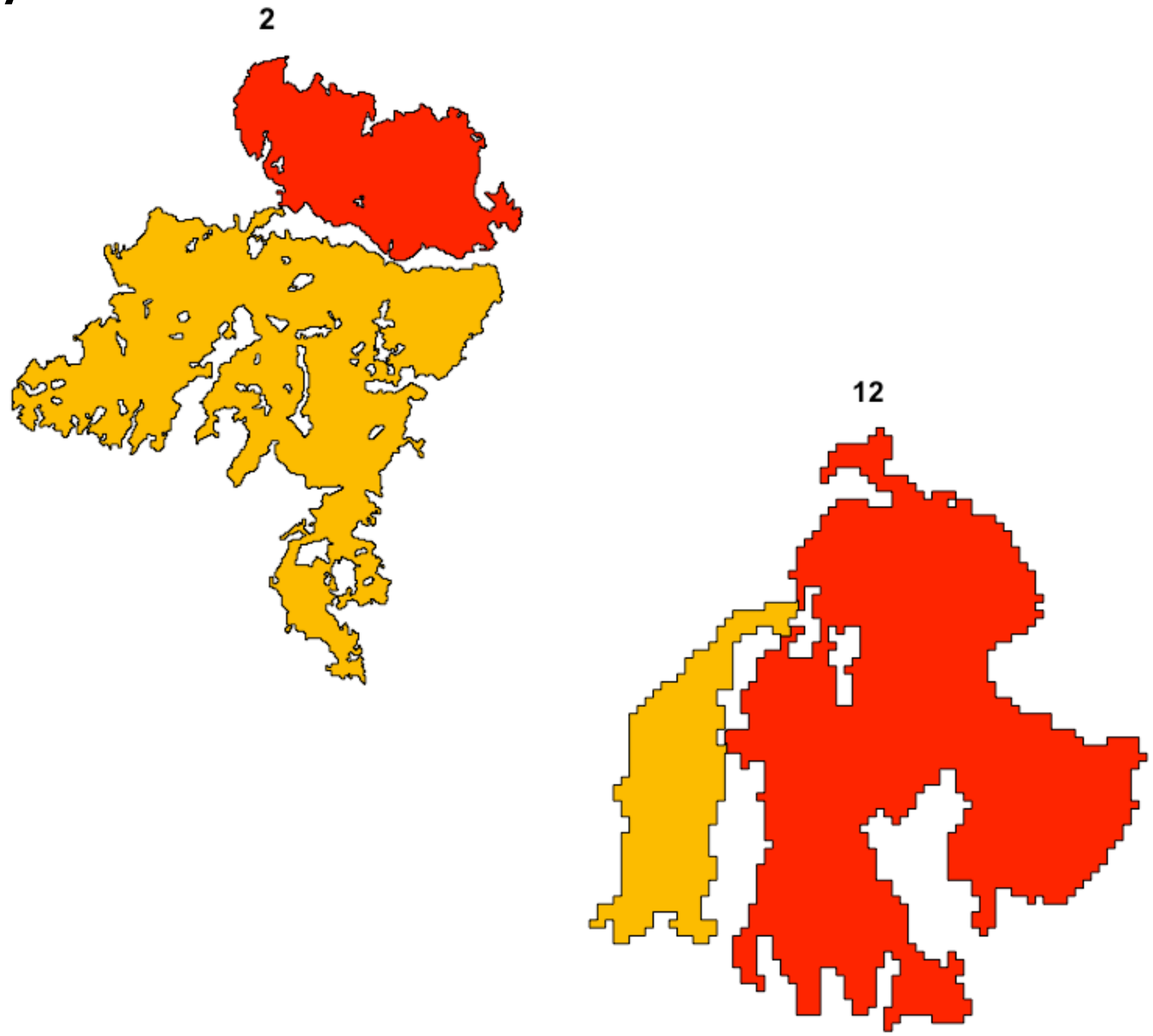
- “clean” each scenario
  - Remove “crumbs” < 1 ha (11 px)
  - Remove “holes” < 1 ha (11 px)
  - Updated script to run on raster layers; much faster.





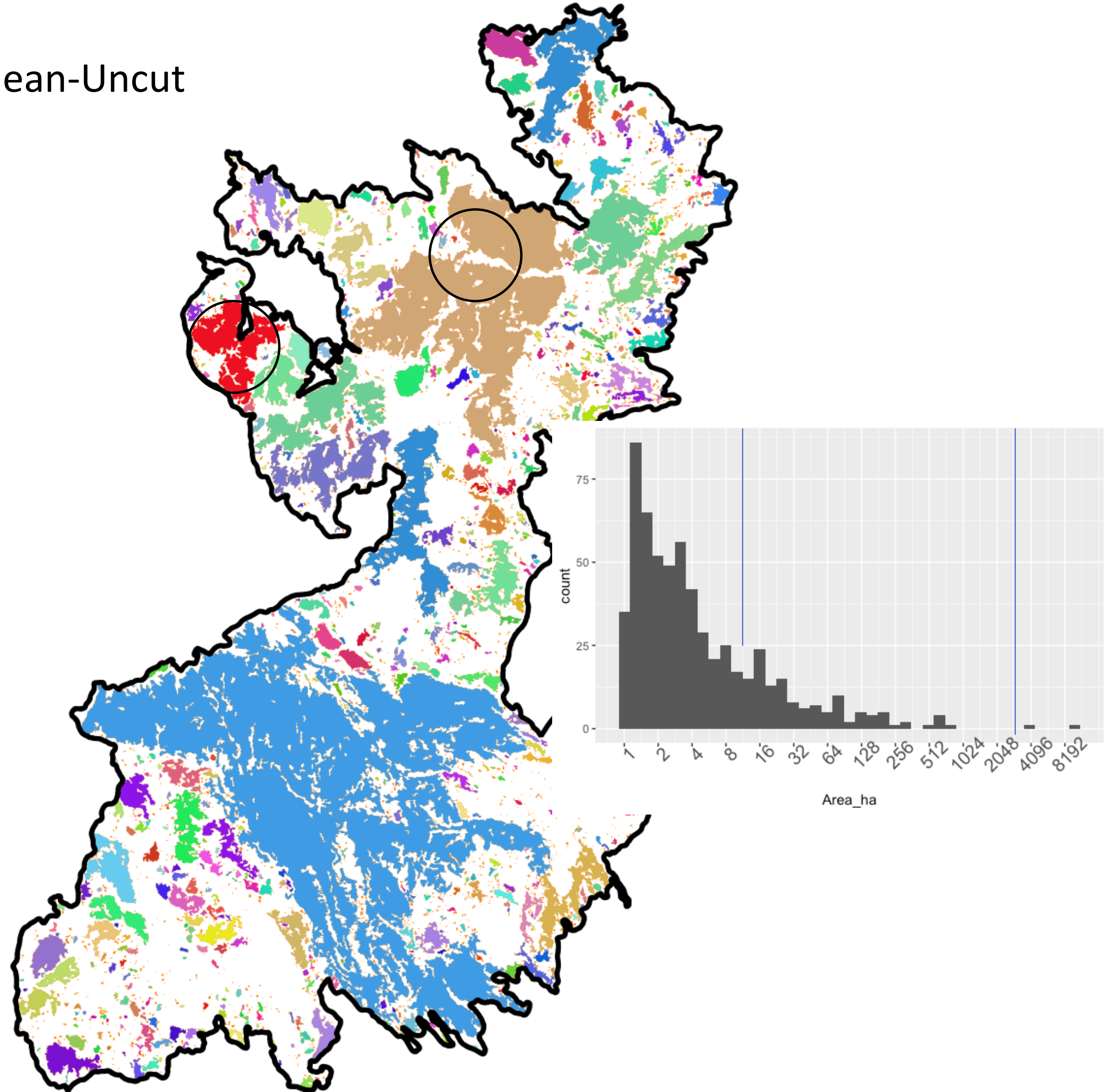
2: processing severity layers

- "clean" each scenario
  - Remove "crumbs" < 1 ha (11 px)
  - Remove "holes" < 1 ha (11 px)
  - Updated script to run on raster layers; much faster.
- "cut" the cleaned polygons at pinch points for more realistic patch size distribution
  - Iteratively buffer every polygon inward by 15 m.
  - Keep doing this until no more 10 ha chunks are created.
  - Then repeat the process with 30, 60 and 120 m buffer increments.

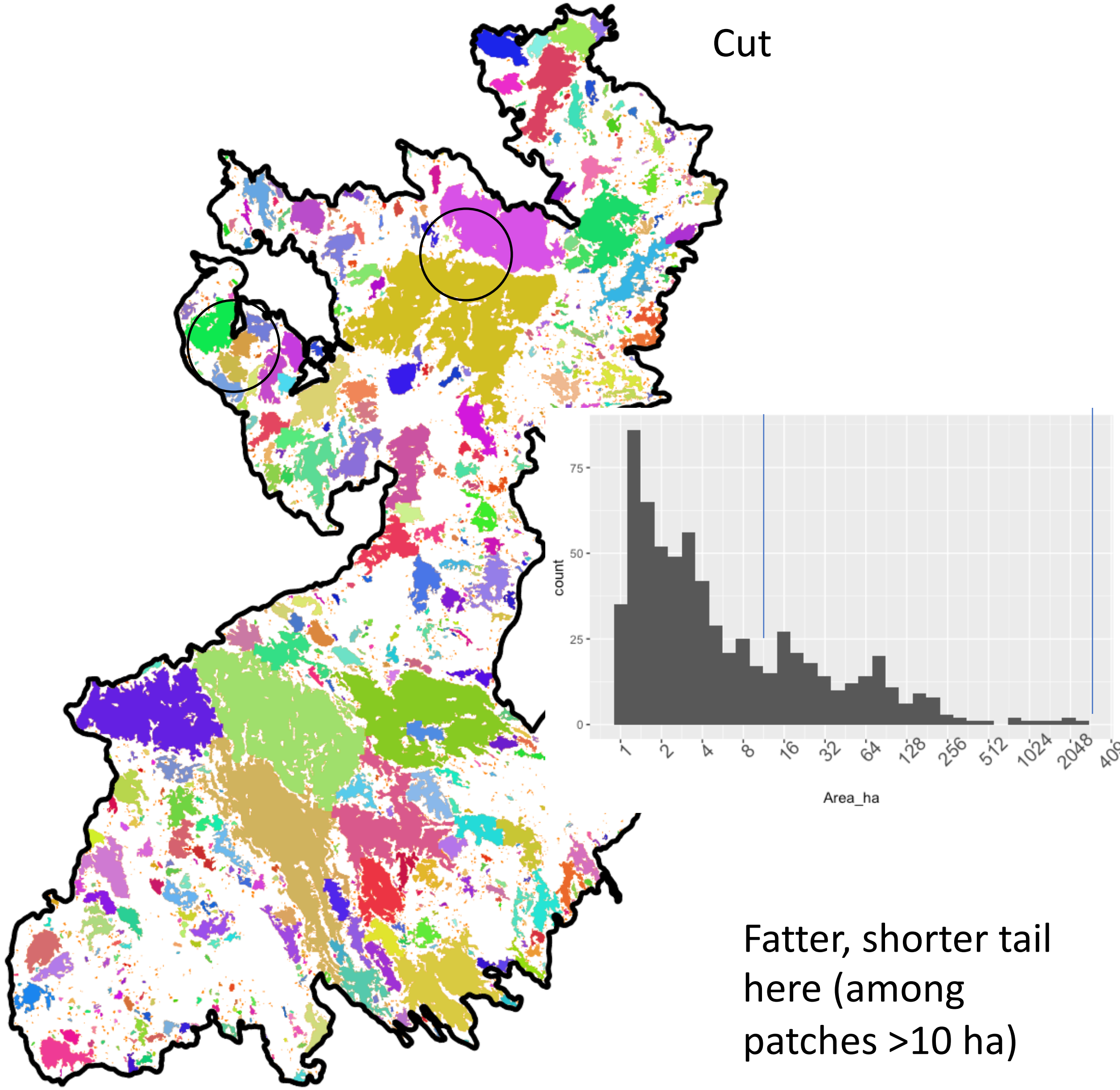


2: processing severity layers (nothing new here)

Clean-Uncut



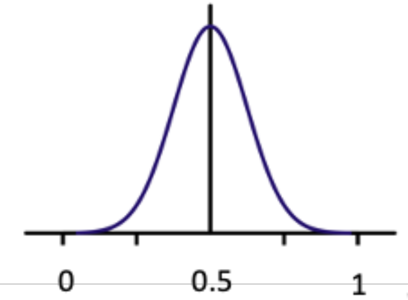
Cut

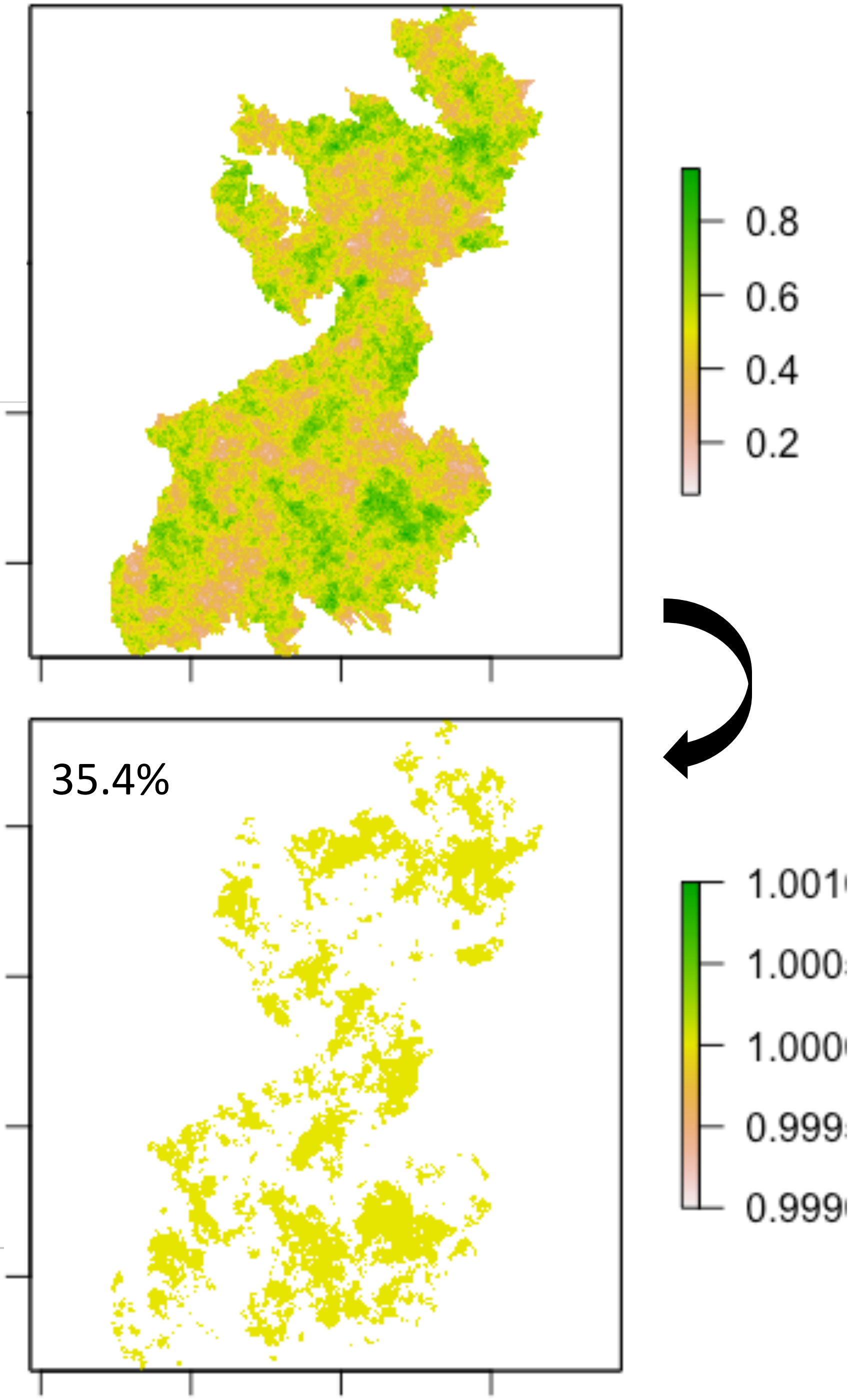


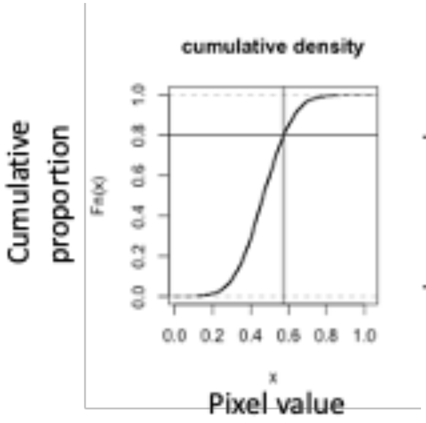
Fatter, shorter tail here (among patches >10 ha)

3: patch distributions – simulating reality

- First pass: fixed high-severity threshold
- Tweak parameters
  - Range = 33m (0.25% of grid area)
    - Maximum range of autocorrelation
  - Nugget = 5
    - Variation in range (unknown units)
- In this example for Las Conchas (35.4% hs), we take the top ~35.4% of the pixels from the distribution and then process ("clean and cut")

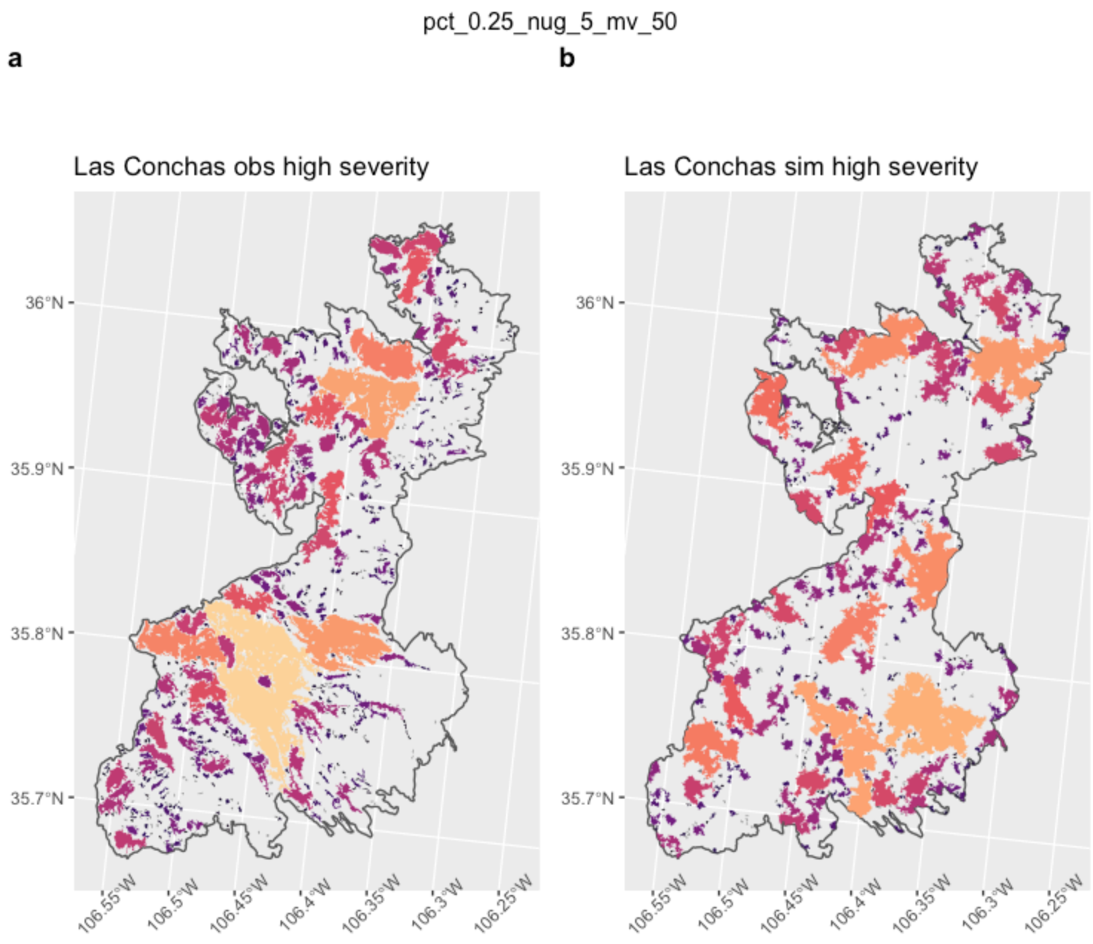


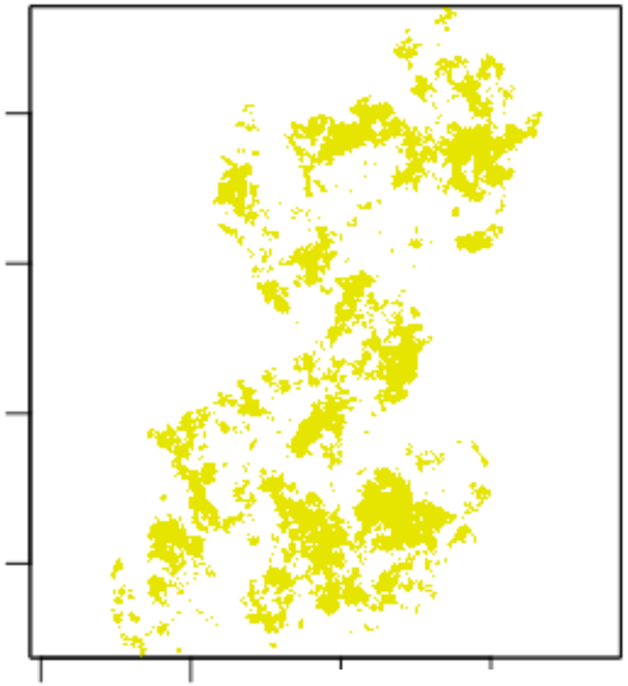




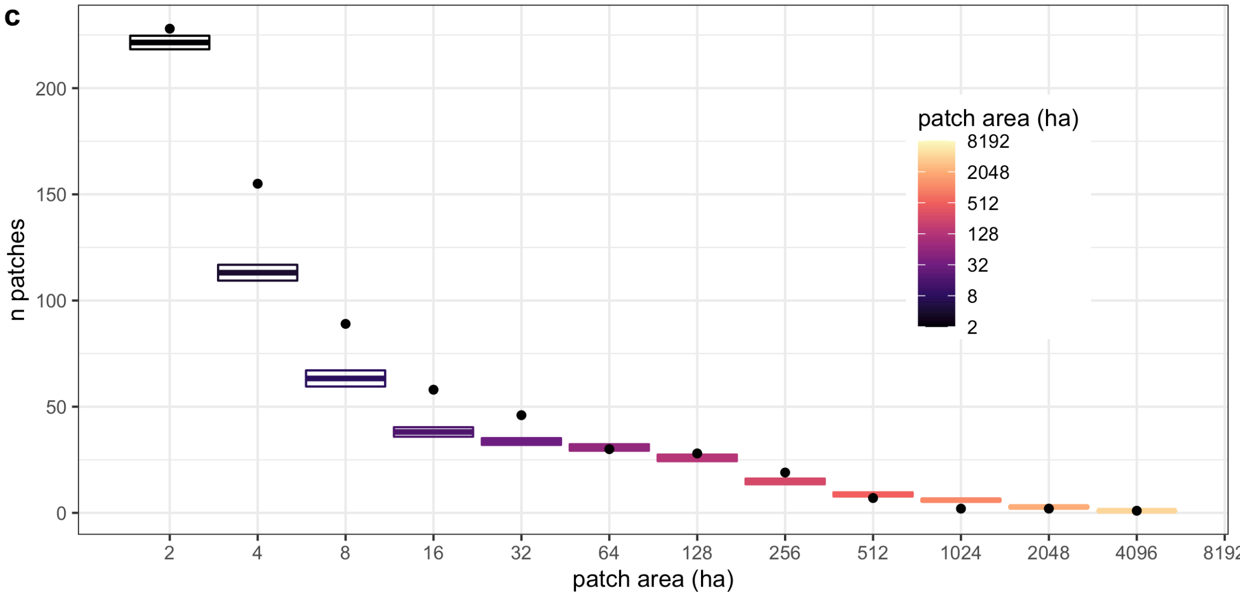
3: patch distributions – simulating reality

- Compare simulation to reality



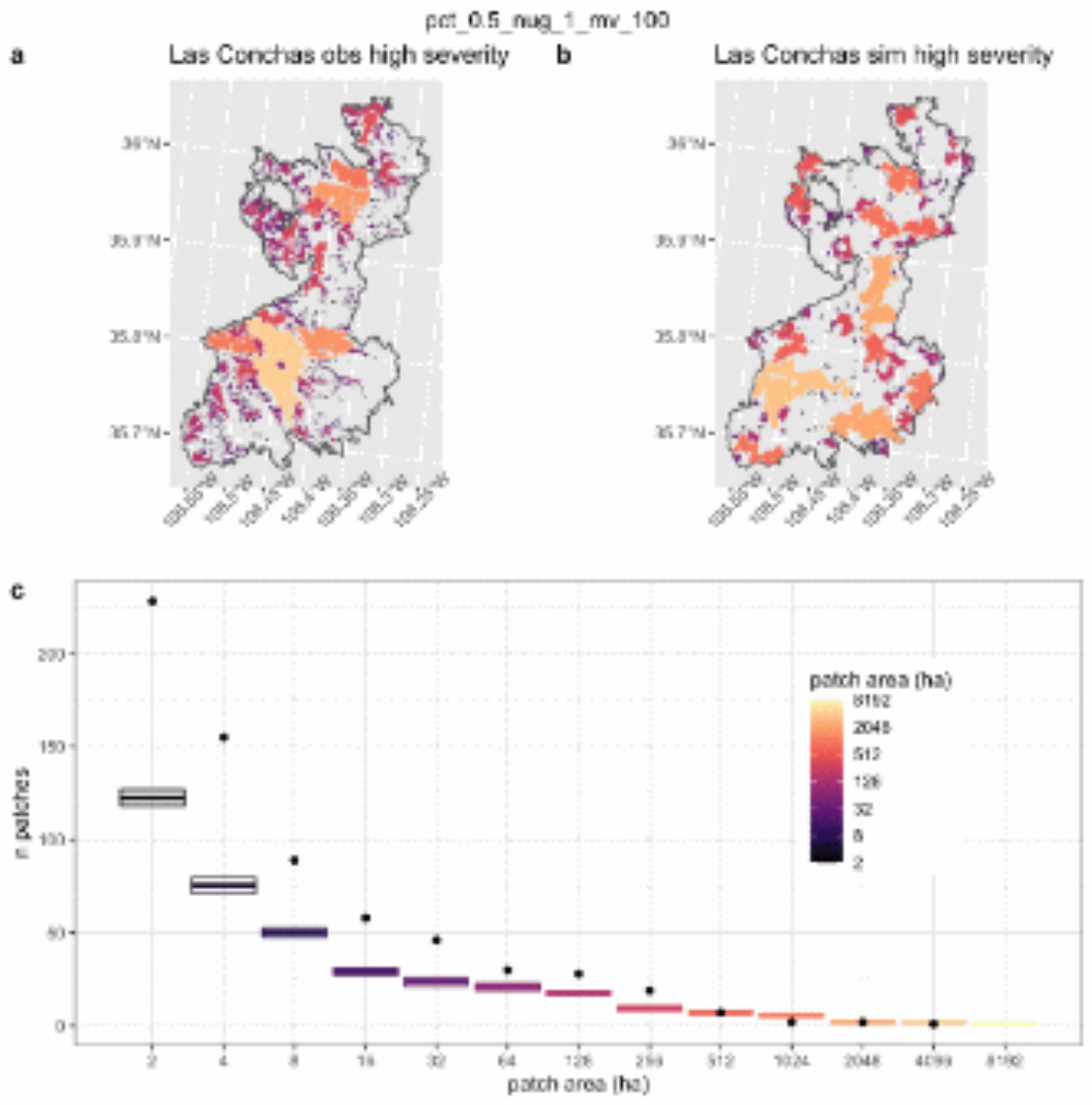


Do this ~10 times to generate distribution



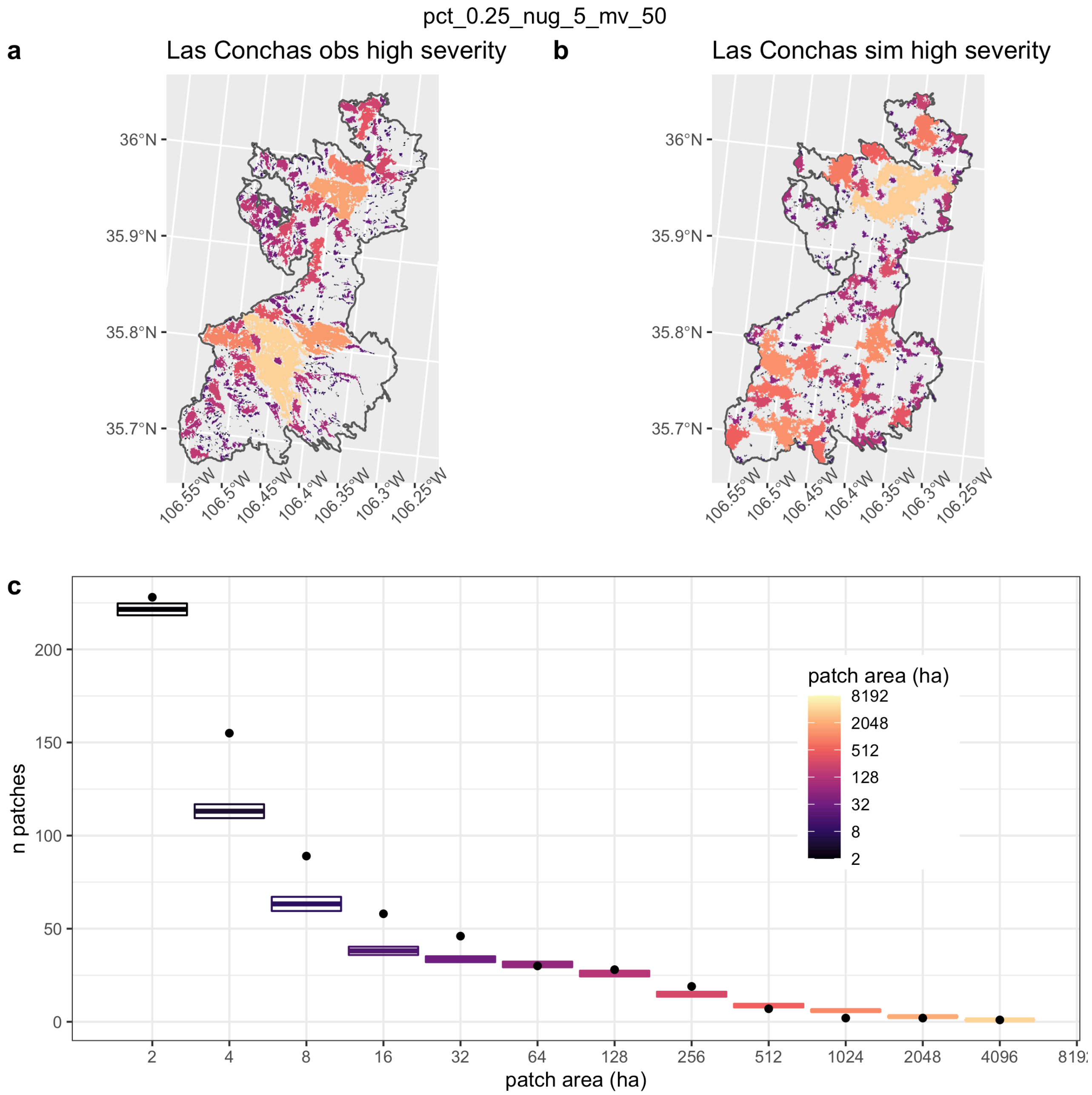
3: patch distributions – simulating reality

- Compare simulation to reality
- Modify parameters and compare distributions.
- Pick the best parameter set and modify from there



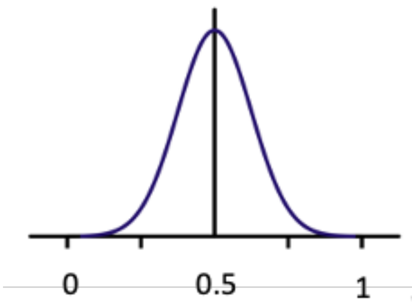
3: patch distributions – simulating reality

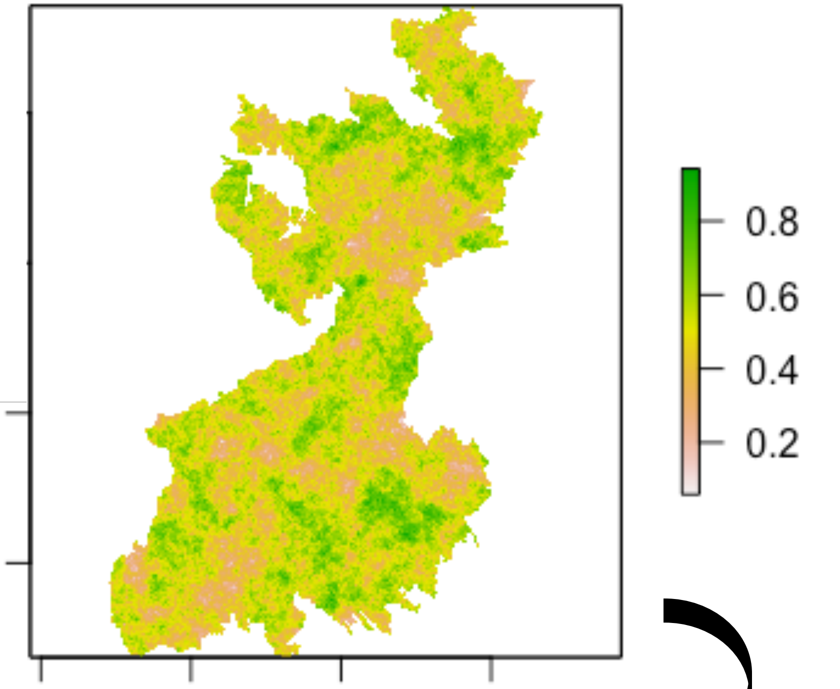
- Compare simulation to reality
- Modify parameters and compare distributions.
- Pick the best parameter set and modify from there
- Got to this local optimum in January
  - Range = 33 m (0.25%)
  - Nugget = 5
- continued tinkering wasn't making much difference

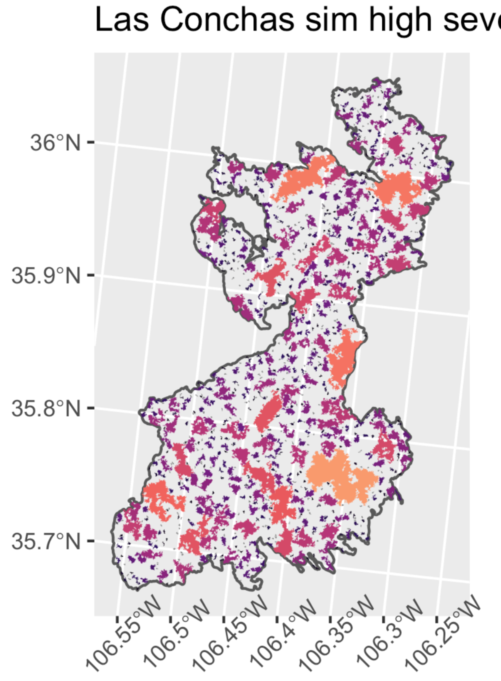


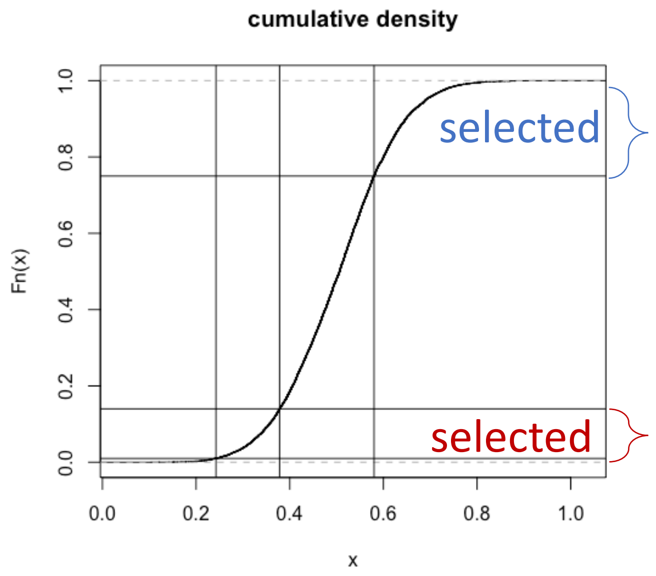
3: patch distributions – simulating reality

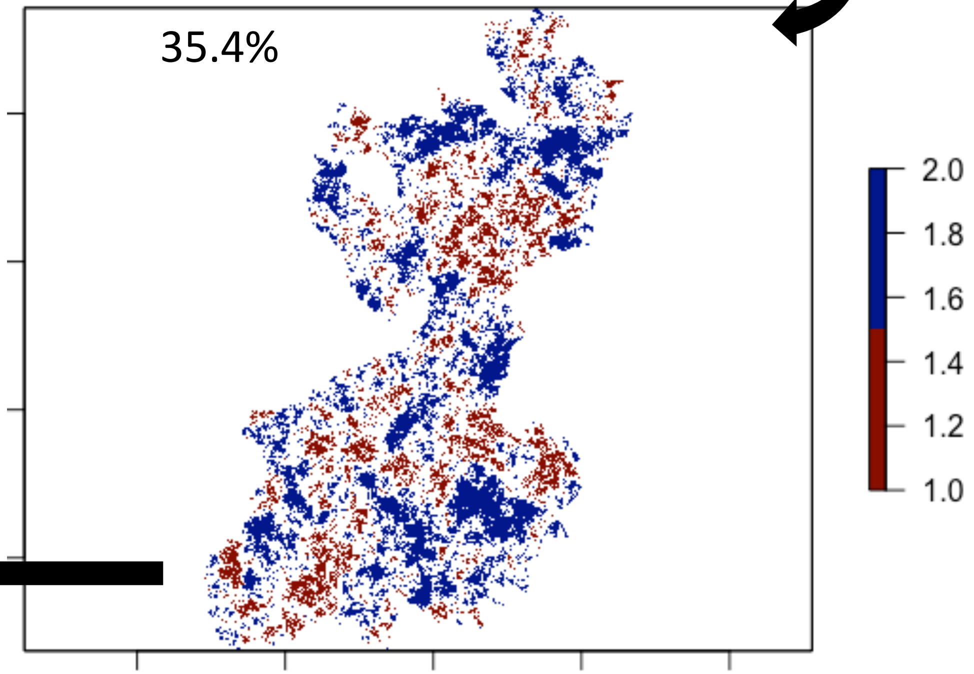
- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.





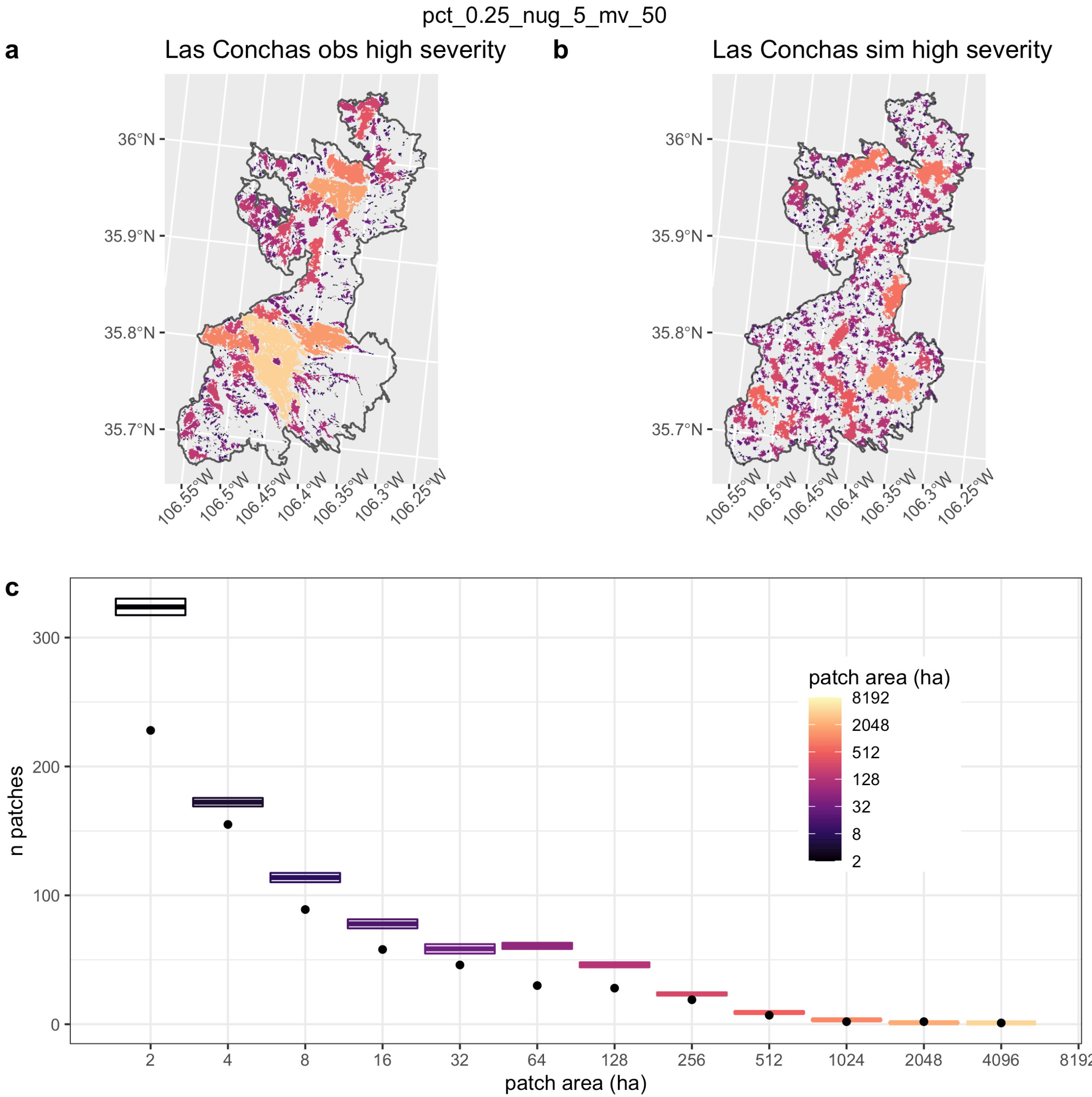






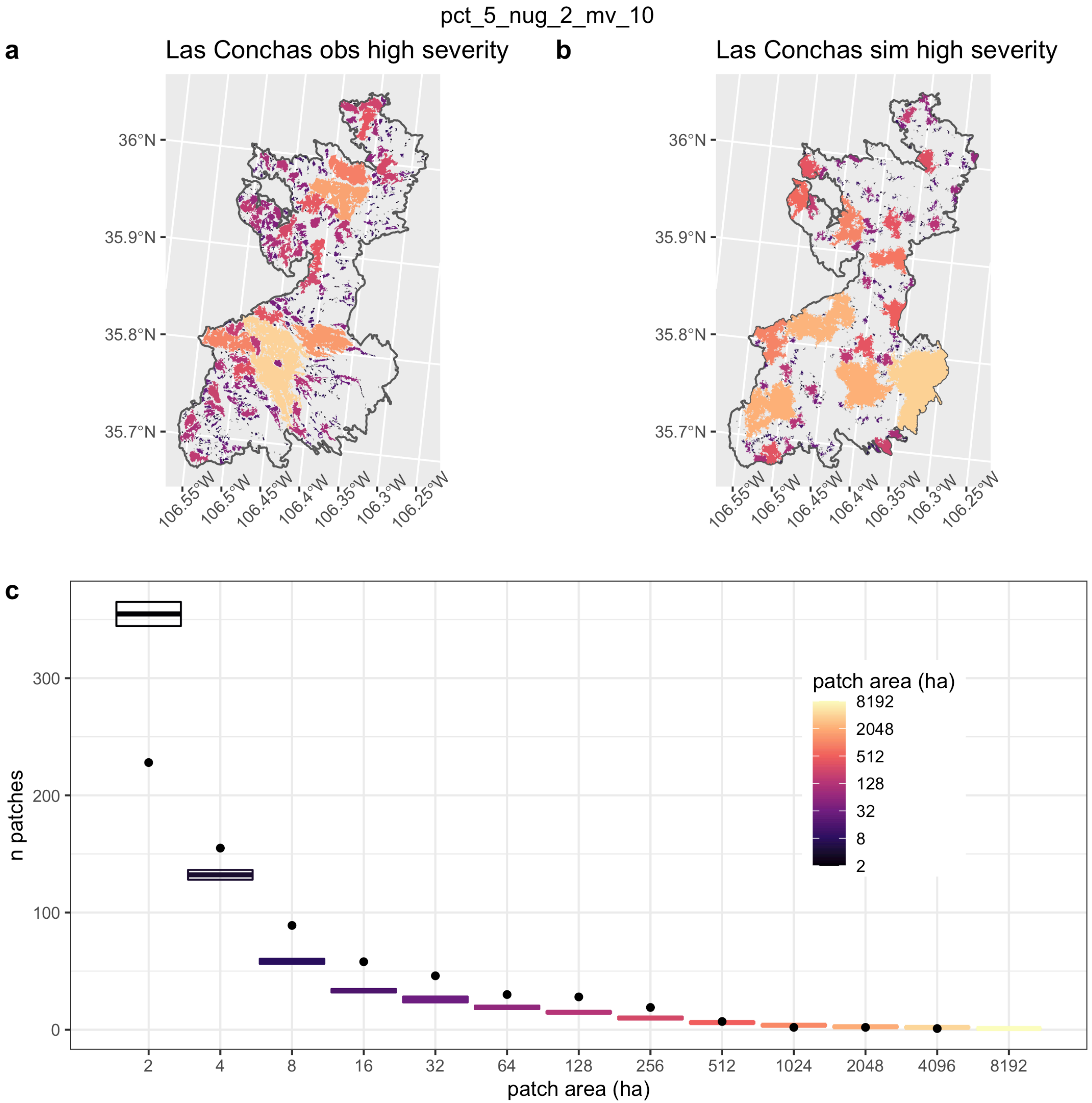
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-14% and > 75%
  - Range = 33 m (0.25%)
  - Nugget = 5



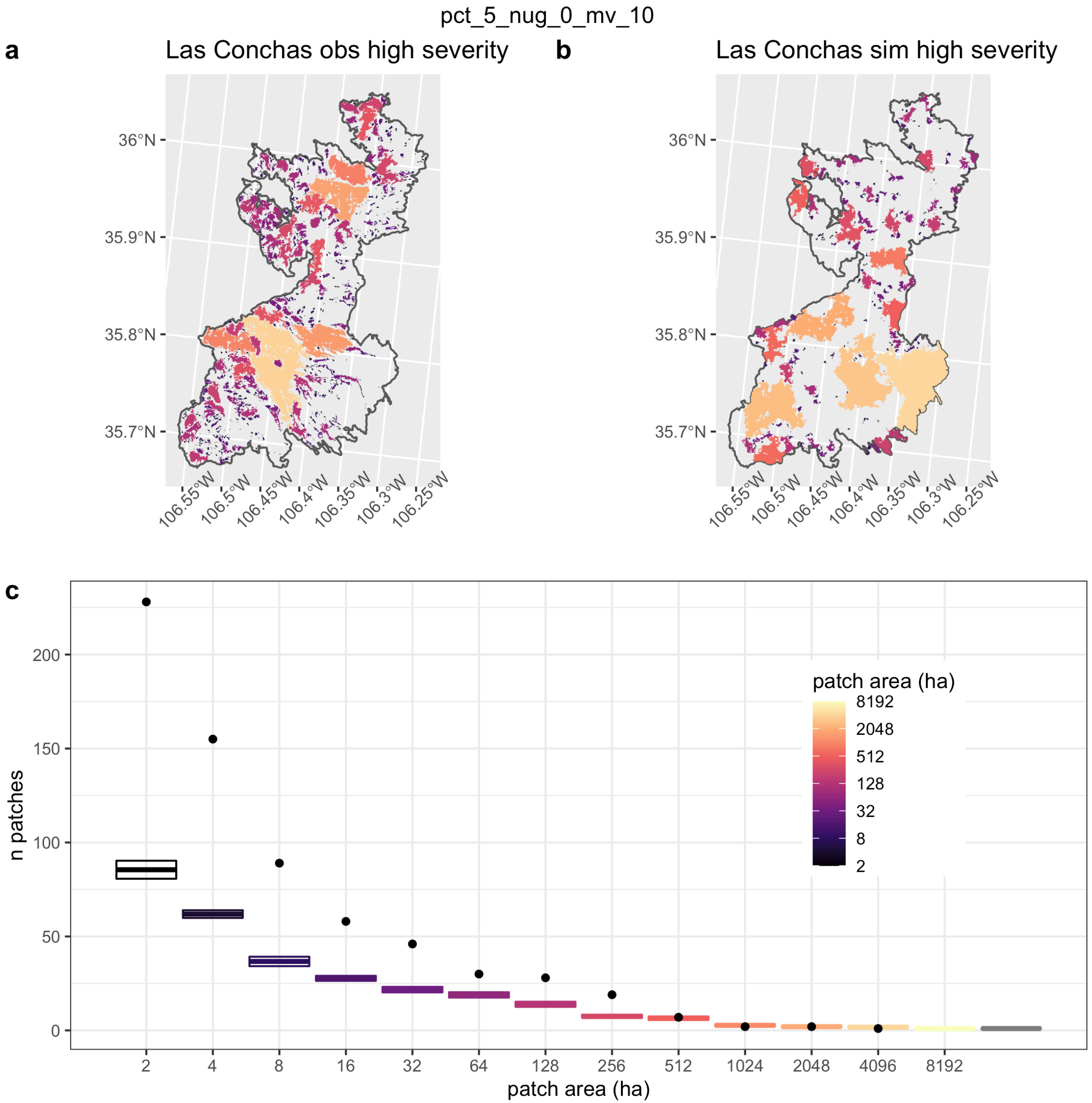
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-14% and > 75%
  - Range = 149 m (5%)
  - Nugget = 2



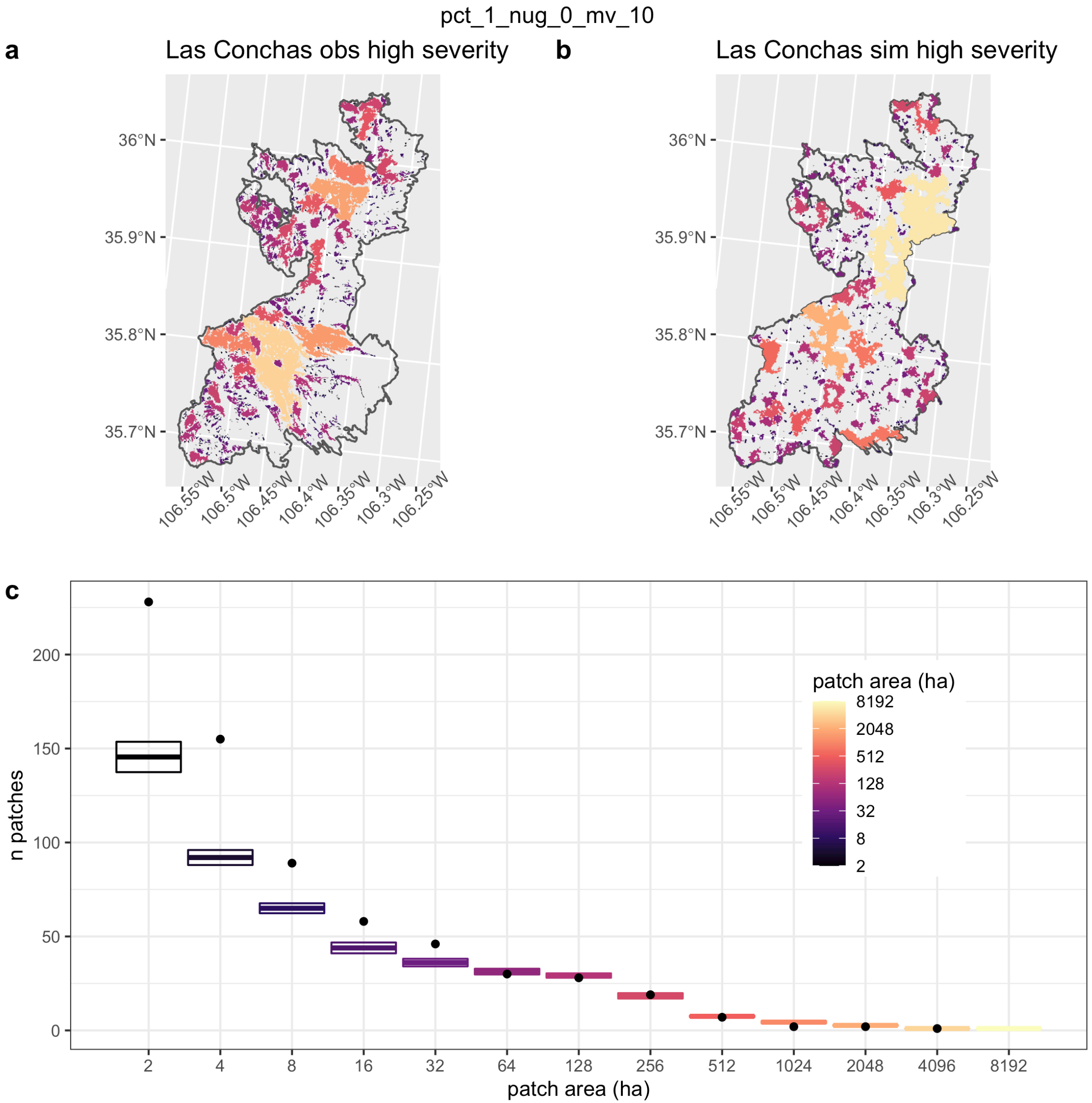
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-12% and > 75%
  - Range = 149 m (5%)
  - Nugget = 0



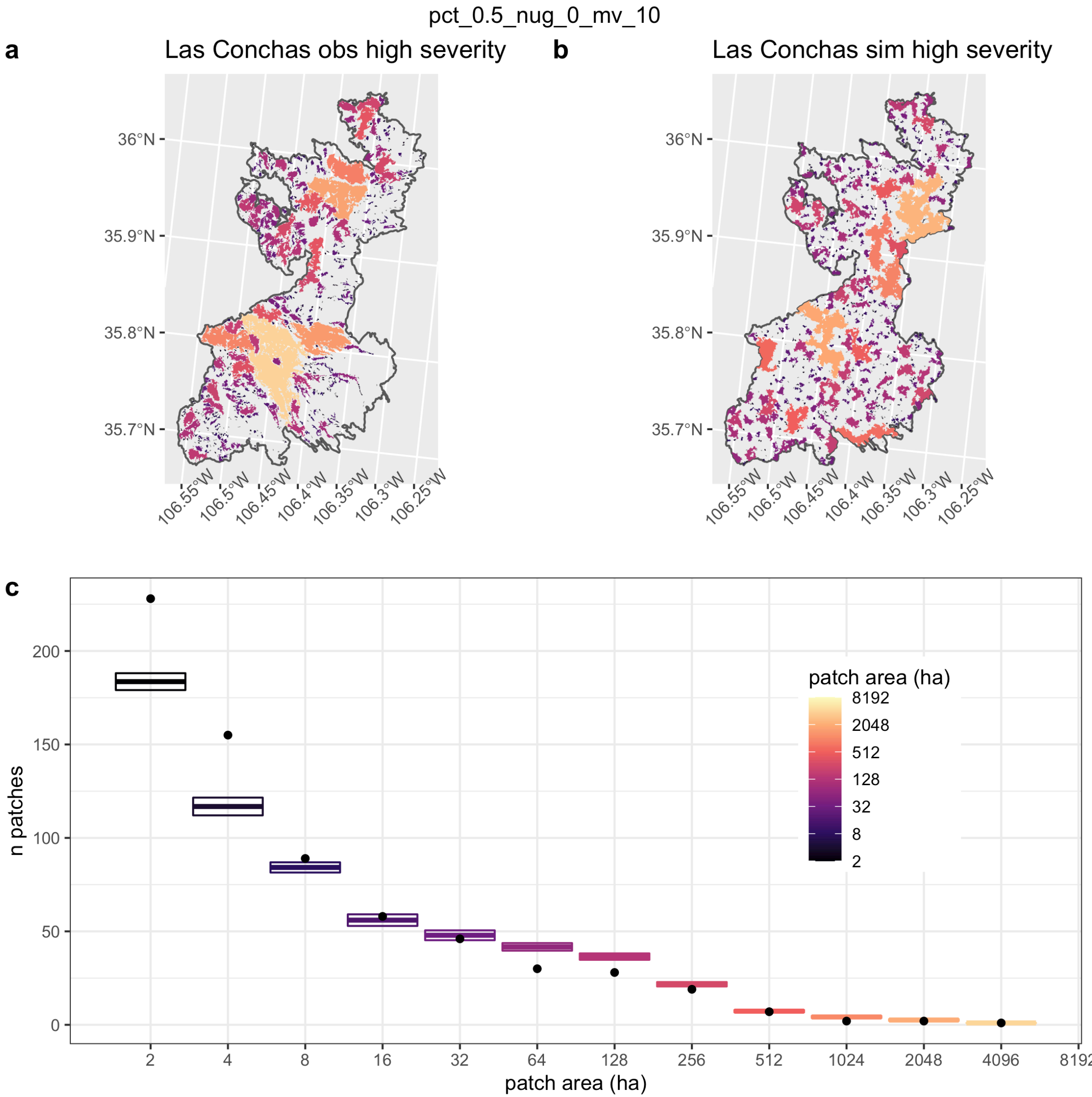
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-12% and > 75%
  - Range = 67 m (1%)
  - Nugget = 0



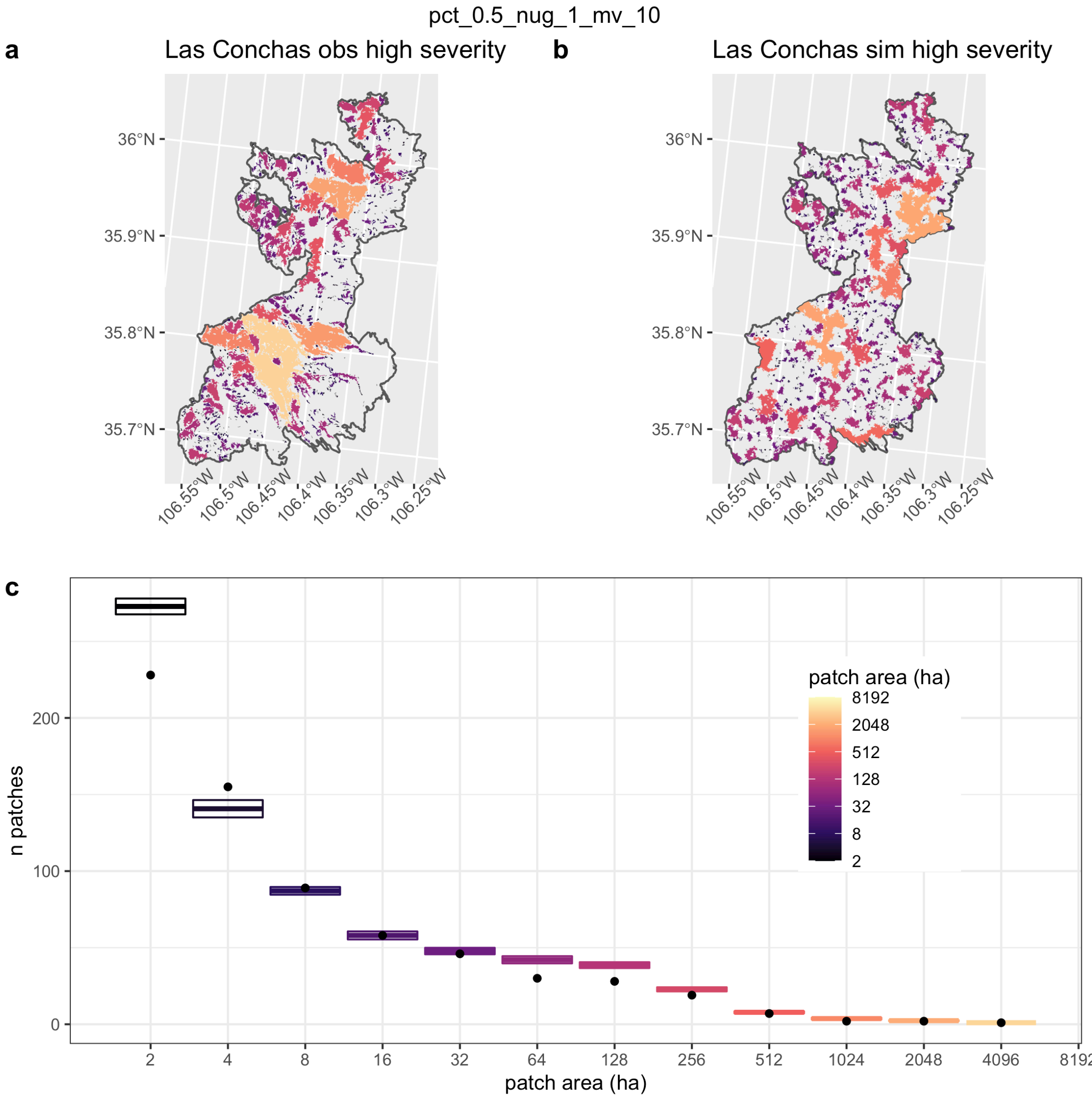
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-12% and > 75%
  - Range = 47 m (0.5%)
  - Nugget = 0



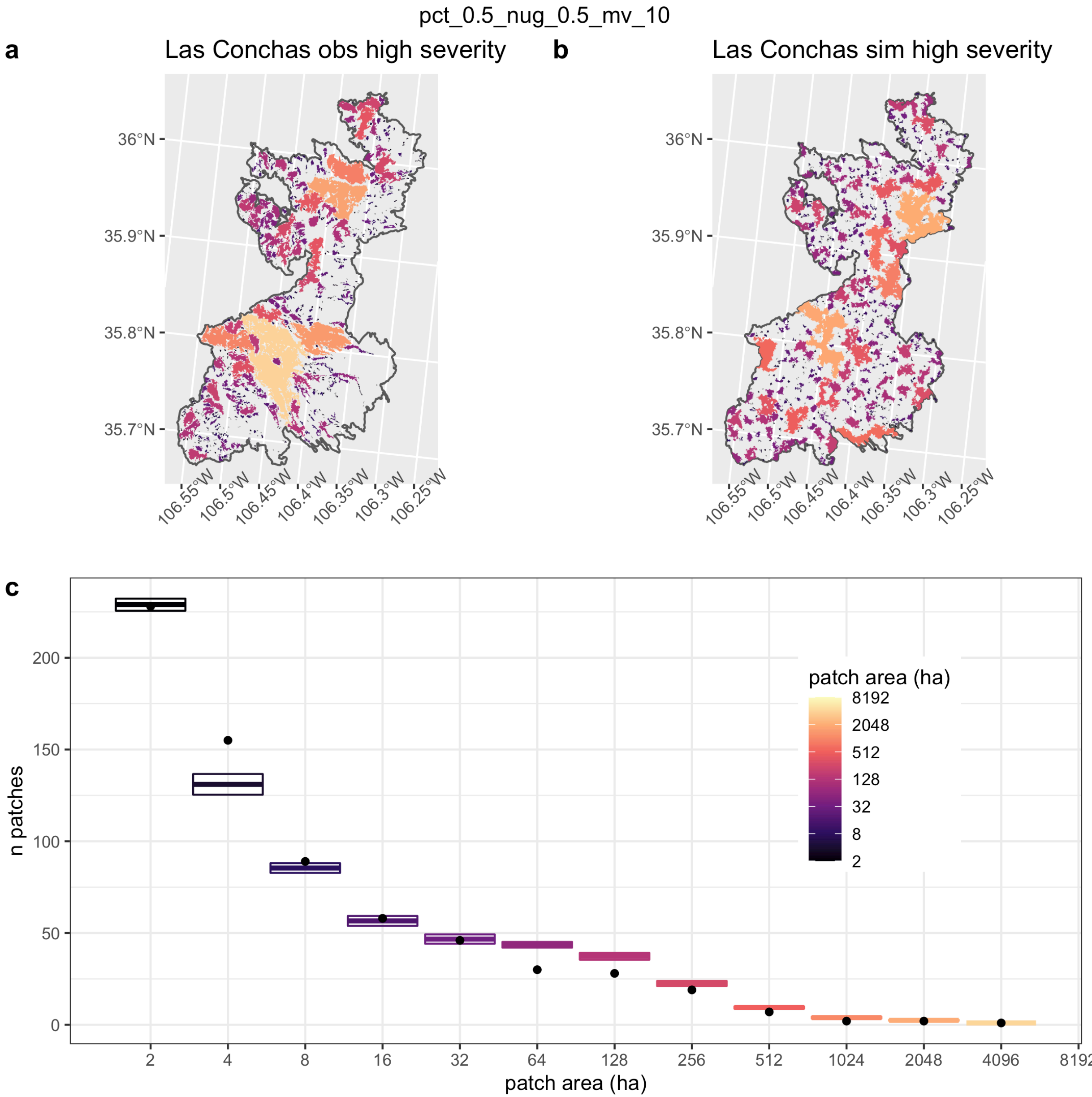
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-14% and > 75%
  - Range = 47 m (0.5%)
  - Nugget = 1



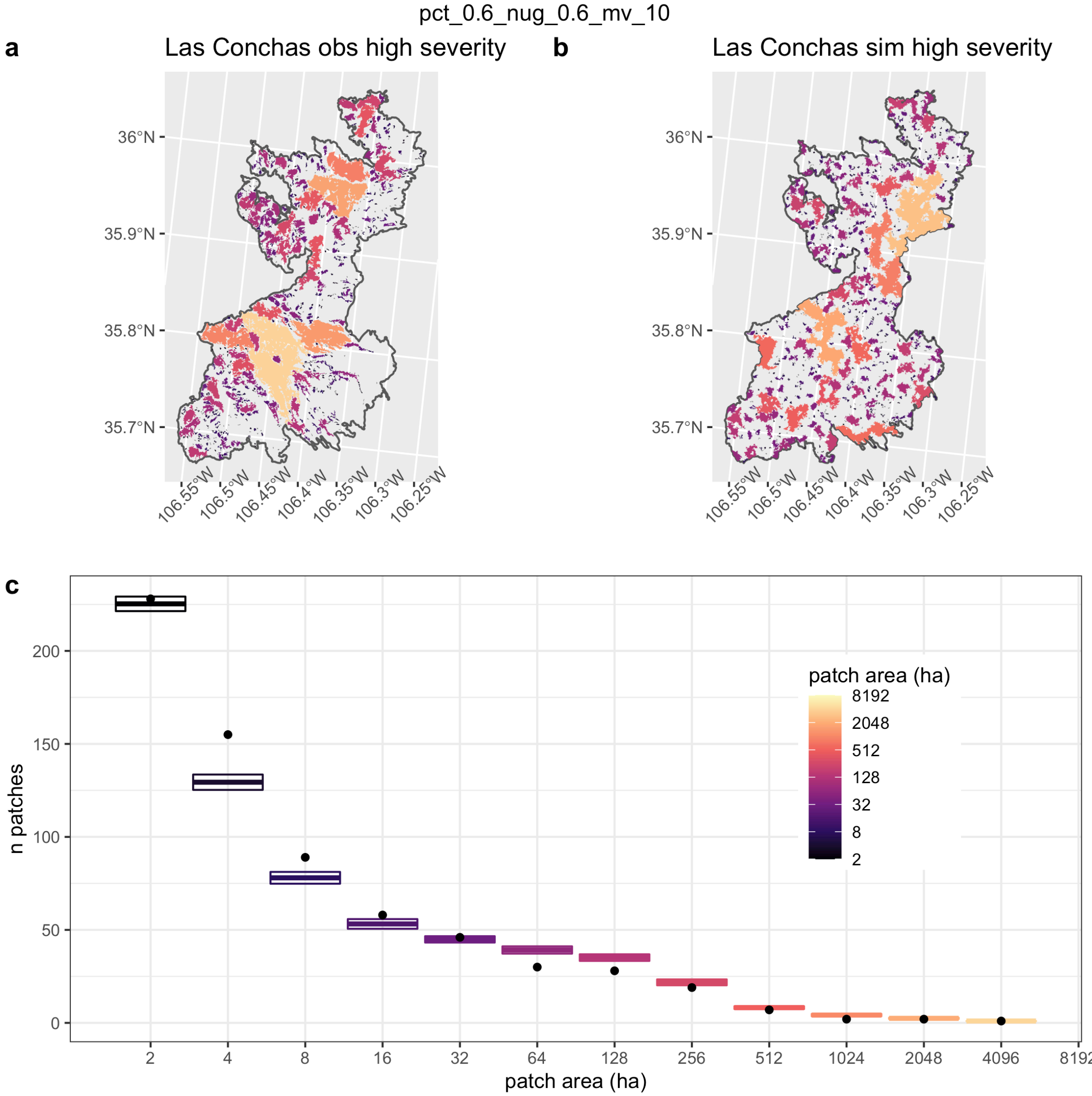
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-14% and > 75%
  - Range = 47 m (0.5%)
  - Nugget = 0.5



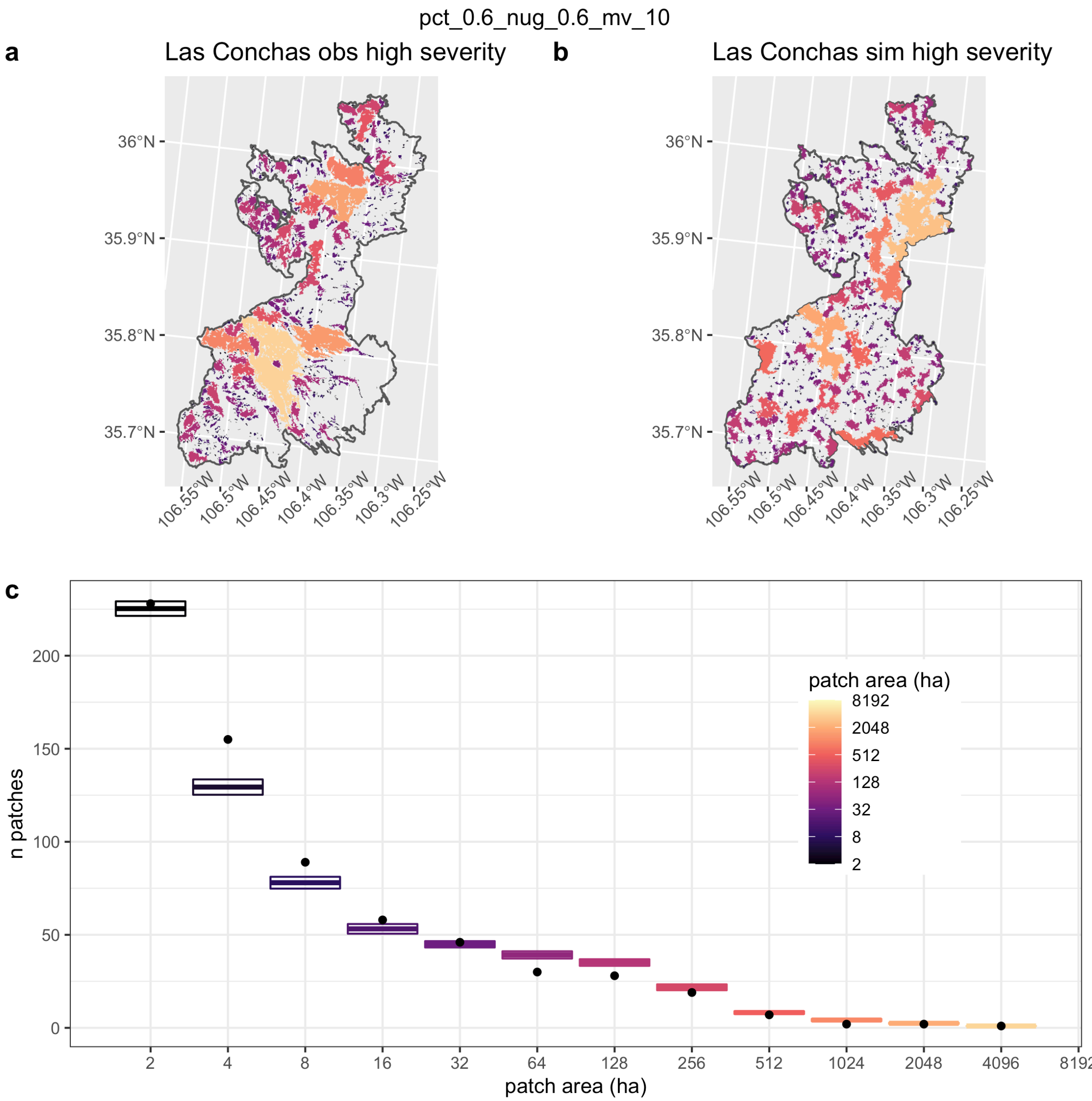
3: patch distributions – simulating reality

- How to get more ~small patches?
- **Second pass**: multiple high-severity thresholds instead of a single one.
- Second pass simulations
  - Gaussian field sample
    - 1-14% and > 75%
  - Range = 52 m (0.6%)
  - Nugget = 0.6
- Winner winner chicken dinner



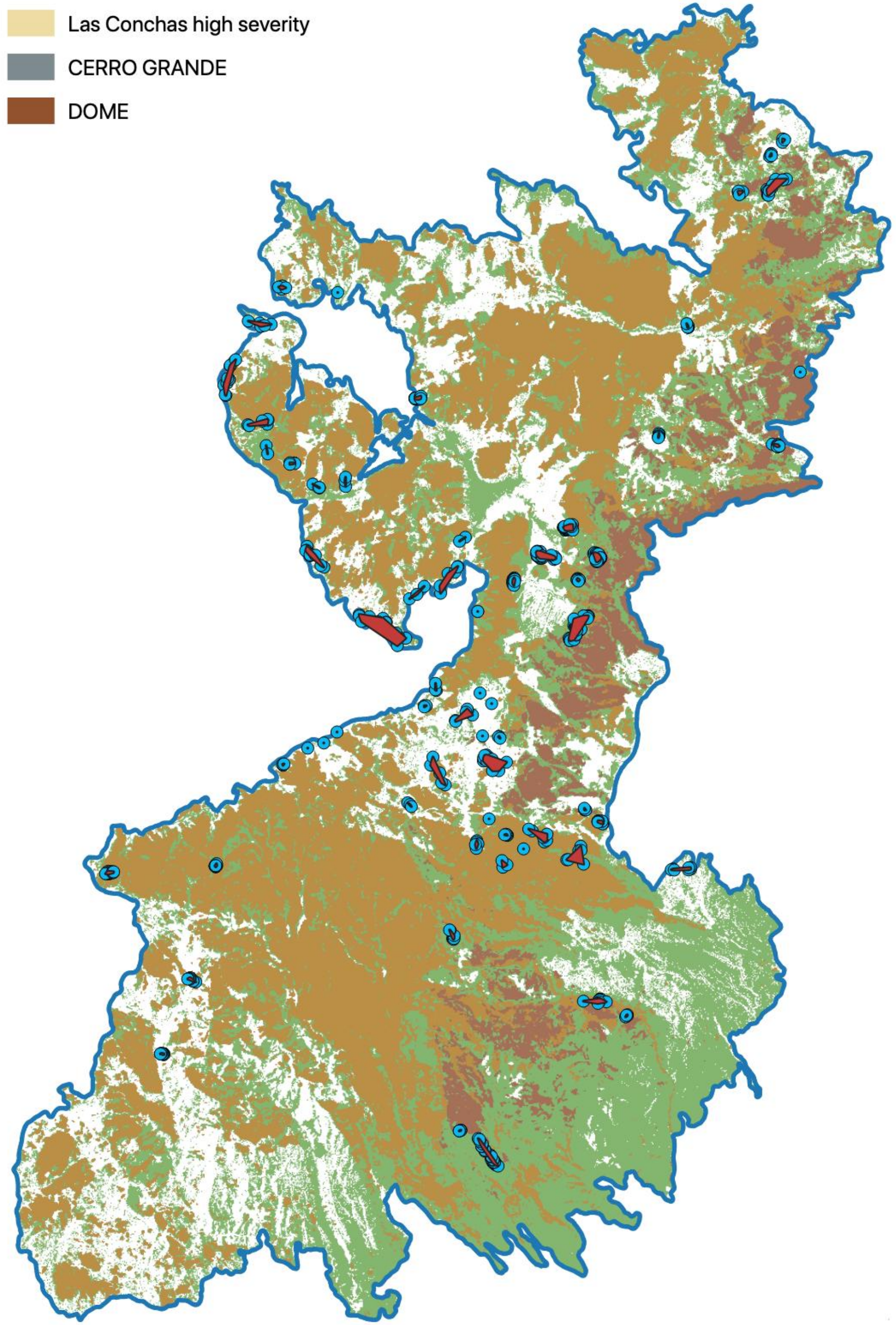
3: patch distributions – simulating reality

- Some problems with this
  - It’s still not capturing reality perfectly (slight overestimation of mid-patches and underestimation of small ones)
  - Taking 2 sections of the distribution is not totally random (overdispersion of some small patches from some large ones)
  - I’ve explored much of the parameter space at this point, not sure there’s anything better possible with this approach
  - Have a few other ideas involving a complete overhaul, but need to move forward

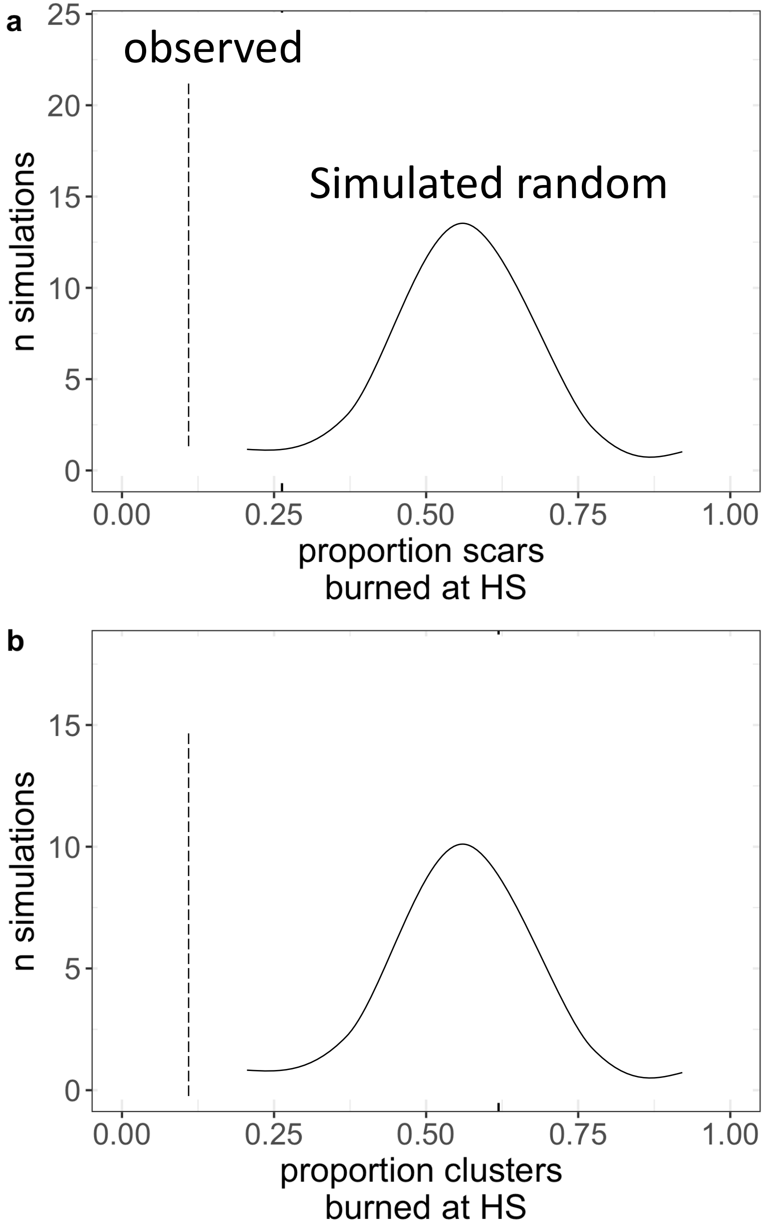


4: scar intersection analyses

- 3 scenarios: lc, all, treeless
- 479 fire scarred trees
- 63 discrete clusters ("dbscan clustering algorithm")



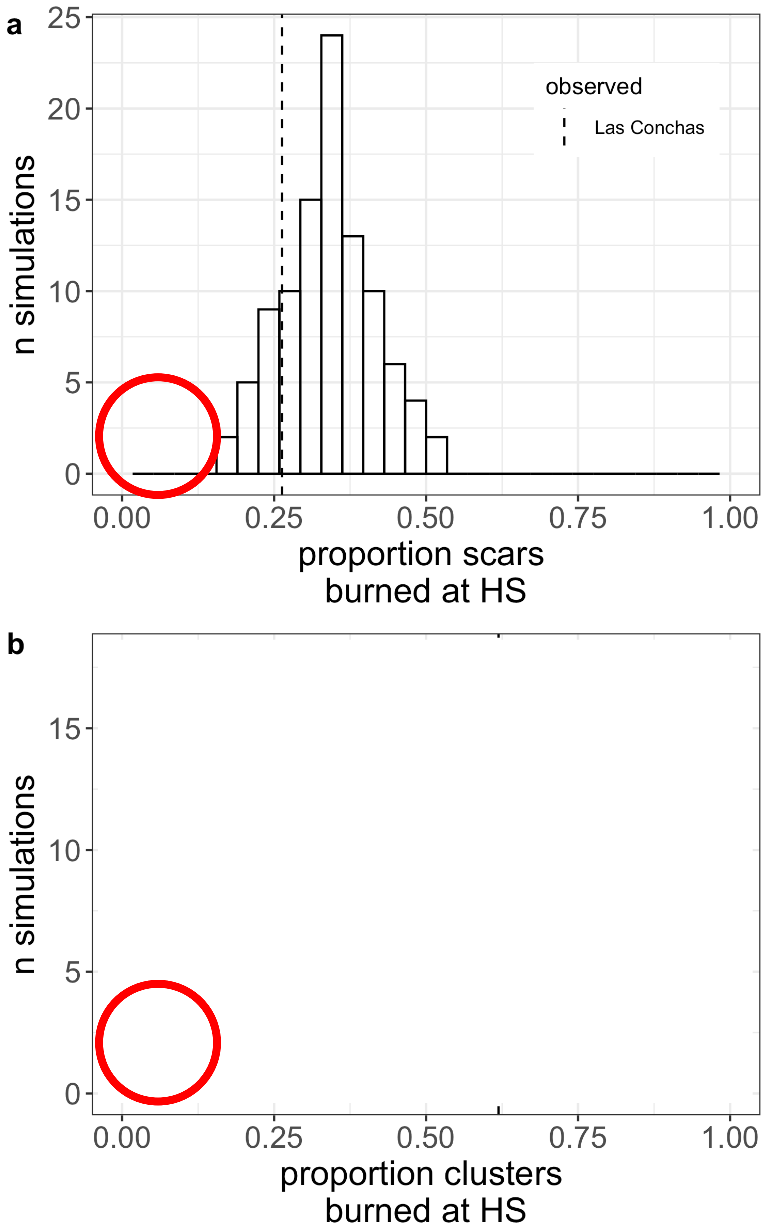
4: scar intersection analyses

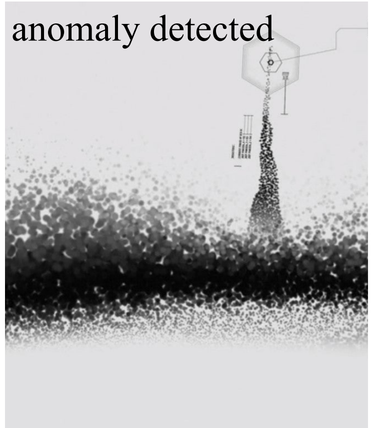


- Hypothesis
  - If Las Conchas is representative of historical high-severity fire extent, then
  - fire scars (and clusters) should **intersect minimally** with high-severity burn areas compared to random

  - Note: Originally had also been thinking in terms of “number/proportion patches hitting a scar”, but this is more dependent on patch distribution than scar network properties.

4: scar intersection analyses





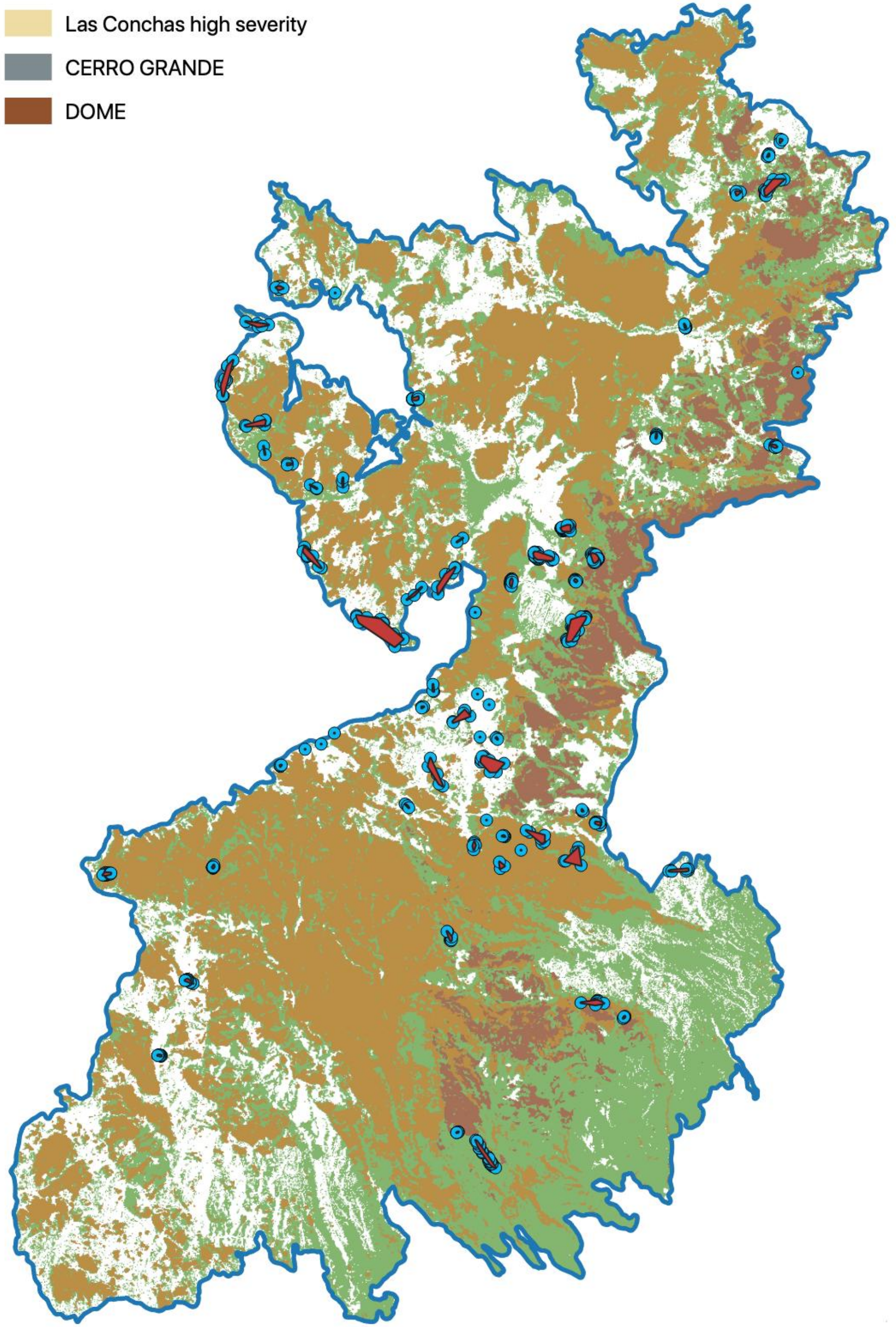
- Result 1
  - Compared to simulated random patches at 35% high severity, Las Conchas was in the
    - 19th percentile for the proportion of scars burned at HS
    - 26th percentile for the proportion of clusters with at least one tree burned at HS
- Result 2
  - **Zero instances** of simulated fire avoiding all scars, at 35% high-severity
- Conclusion
  1. The Las Conchas fire resembled a random distribution of high-severity patches more than a “fire-scar avoiding” scenario
  2. Las Conchas is inconsistent with even a conservative estimate of high-severity extent based solely on fire scar presence.

4: scar intersection analyses

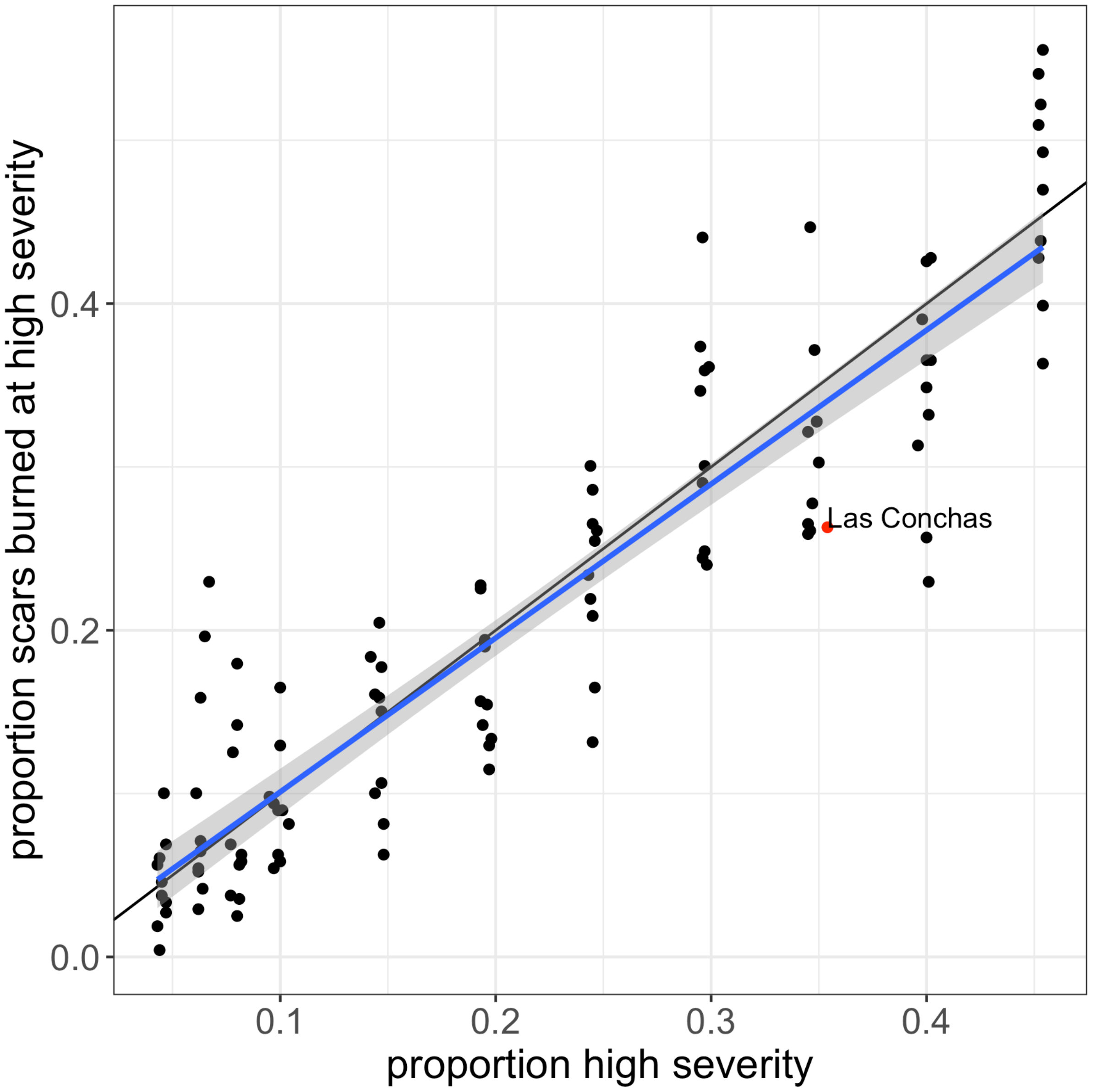
- 3 scenarios: lc, all, treeless
- 479 fire scarred trees
- 63 discrete clusters (“dbscan clustering algorithm”)

- Comparison of scenarios:

Scenario	% HS	% scars overlapped	% clusters overlapped
lc	35.4%	26.3%	61.9%
all	42.8%	35.1%	74.6%
treeless	65.5%		

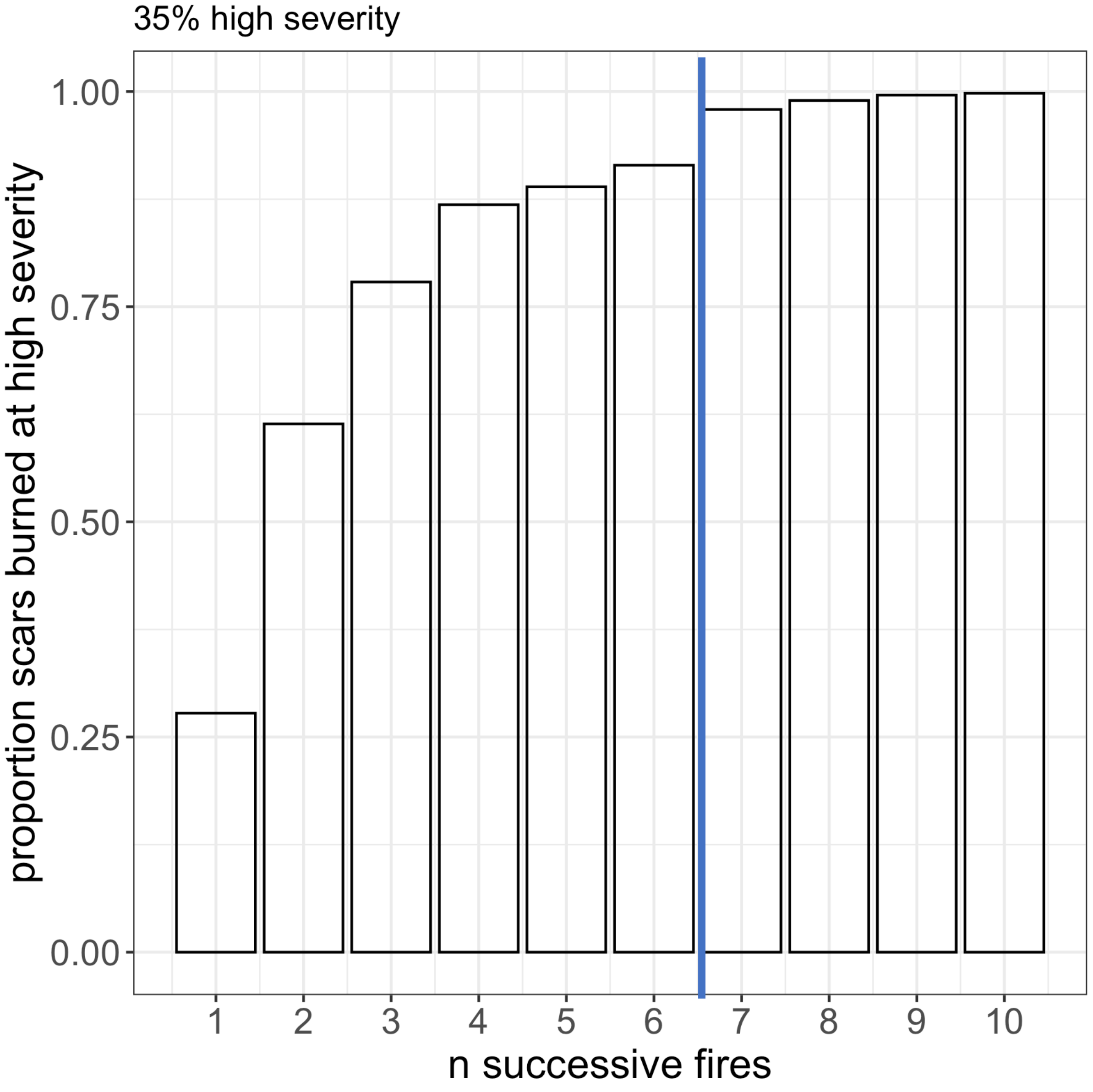


Bonus Question!

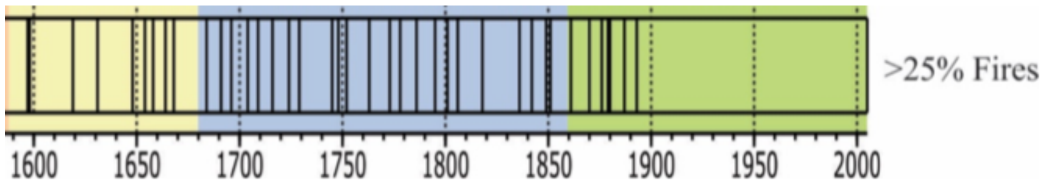


- Given current best-fit aggregation parameters, how does fire scar intersection scale with proportion high-severity?
  - Linear fit
  - How do the aggregation parameters influence fire scar intersection for a given proportion high-severity?

Another Bonus Question!



- This is just one fire event. If this is characteristic fire behavior, how many repeat fires will eliminate all fire scars?
  - Recall the ~10 year fire return interval



  - Answer: About 7 (~70 years)

4: scar intersection analyses

- What else do we want to ask?