SPATIAL HETEROGENEITY SUB-GROUP UPDATE

THURSDAY 23RD JANUARY 2014

YVETTE DICKINSON

COLORADO FOREST
RESTORATION INSTITUTE

OUR CHARGE…

Make recommendations to LR team regarding desired conditions and monitoring methods for forest spatial heterogeneity across scales.

DESIRED CONDITIONS PROCESS

Developed DC's within-stand ("groupy-clumpy") and landscape heterogeneity separately

Desired conditions:

- Literature review and expert opinion
- Undesirable conditions?
- Likely drivers of patterns?
- Likely consequences of patterns?
- Desired conditions?
- CFRI whitepaper currently being drafted
- Cross-pollination with GTR

COLORADO FOREST
RESTORATION INSTITUTE

LANDSCAPE SCALE

Define landscape as HUC-12 watershed(s) surrounding treatment

COLORADO FOREST
RESTORATION INSTITUTE

LANDSCAPE SCALE

- Generally, treatments should create openings, groups of trees and single isolated trees within stands. The proportion and size of these openings, groups and single-trees should vary within and among stands resulting in the desired conditions identified at the landscape-scale (see 4.4 Desired landscape-scale forest patterns). On low productivity sites (generally drier sites at lower elevations and/or south facing slopes) there should be a greater prevalence of openings and single-isolated trees. On relatively high productivity sites (generally with higher moister availability at higher elevations and/or north facing slopes) there should be a greater prevalence of larger tree groups with fewer openings and isolated trees.
- Because they are relatively rare, older, scarred and character trees should be protected by leaving them as isolated single trees or, if within tree groups, protected by removing surrounding ladder fuels.
- On lower productivity sites (drier sites at lower elevations and/or south-facing slopes) treatments should favor ponderosa pine and preferentially remove Douglas-fir; however, on more productive sites (with higher moisture availability at higher elevations and/or north-facing slopes) a greater variety of species should be maintained. Where present, aspen should be maintained within the stand, and openings around aspen should be created where distinct aspen groves are identified.
- The proportion of trees in groups should vary stand to stand, ranging from 0 to 80% of trees in groups. However, the majority of stands across the landscape should have 30 to 60% of trees in groups. These groups may range in size from 2 to 20 trees with larger groups on more productive sites; however, on most sites the median group size should be small (2-3 trees).
- Groups of trees may be either even or uneven-aged; however, more productive sites (sites with higher moisture availability at higher elevations and/or north-facing slopes) are likely to have greater proportions of uneven-aged groups.
- Both even and uneven-aged stands exist across the landscape; however, there is a predominance of uneven-aged stands with a range of tree sizes, ages and shapes.

WITHIN-STAND SCALE

- Higher tree densities within patches on north aspects than on south aspects; at higher elevations with mixed conifer than lower elevations with ponderosa; and in draws than on ridges.
- Larger patches (forested or open) should occur on north facing slopes compared to south facing slope (perhaps the whole slope in contrast to partial disturbance).
- Steep topography tends to facilitate fire movement into the canopy; therefore, we expect that larger patches (forested or open) should occur on steep topography. However, where the topography is highly dissected, substantial topographic breaks should restrict patch size.
- Larger patches (forested or open) at higher elevations with mixed conifer forest types (10-100's acres) than smaller patch sizes at lower elevations ponderosa forest types.
- Generally a negative exponential pattern of patch sizes within HUC-12 watersheds with many patches (<4ha) that occupy <50% of total area; and few large patches (>10 ha) which occupy >50% of total area.
- Patches (forested or open) should generally follow topographic and environmental gradients; and not arbitrary management boundaries (e.g. property boundaries).
- It is expected that aspen will benefit from decreases in coniferous canopy cover across the landscape. Furthermore, where apsen is present it should be protected.
- Needs more attention. See comment on previous page.

MONITORING METHODS

WITHIN-STAND SCALE MONITORING

- Tested proposed aerial-imagery methods previously presented on Phantom Creek 1 & 3, and Ryan Quinlan (Kristen Pelz and Josh Howie)
- Protocol for aerial-imagery methods “in press” (Kristen Pelz)
- Exploration of possible field methods using point sampling (Jeff Cadry)
- Subgroup recommendations:
  - Implement aerial image analysis methods for monitoring (3-year cycle)
  - Analyze the variation among CSE plots as a non-spatial indicator of heterogeneity in short-term
  - Continue to explore other field based methods for short-term indicators (Modified Pielou’s index?)

WITHIN-STAND SCALE MONITORING: OUTCOMES OF TESTING

Outcomes from Phantom Creek (1& 3) and Ryan Quinlan monitoring:

- The percent of canopy cover in the stand declined with treatment in all stands.
  - Canopy cover in the Phantom Creek treatments decreased by 26.5% on average from 59.13% to 32.6%. Likewise, the canopy cover in the Ryan Quinlan treatments decreased by approximately 21% from 35.1% to 14.1%.
- The largest patch index (LPI, percent of the area covered by the single largest canopy patch) also declined in all treatments (except Phantom C where LPI did not change); however, the decrease in LPI was far greater for some treatment areas than others.
  - For example, Phantom Creek 1A had a reduction in LPI from 61% to <1%. In contrast, the pre-treatment LPI for the Ryan Quinlan units was generally much smaller (<15%) than in the Phantom Creek units so LPI reduction was necessarily smaller.

WITHIN-STAND SCALE MONITORING: OUTCOMES OF TESTING

- Mean canopy patch size decreased on all treatment units.
- The diversity of canopy patch sizes (as shown by range, standard deviation and coefficient of variation of patch size) decreased on all treatment units except in Phantom Creek 3.
  - This decline in diversity of patch size is undesirable; however, both Phantom Creek and Ryan Quinlan were early FR-CFLRP treatments and more recent treatments are likely to address this.
- The mean distance between neighboring patches stayed the same or slightly increased in all treatments; however, the range of distances between nearest patches increased in all treatment units (except Phantom Creek 3).

LANDSCAPE SCALE MONITORING

- The plan:
  - Data collected over summer to be used to train LANDSAT data and create forest cover map (~30m pixels) (Mark Klein, Tyler Rowe and Yvette Dickinson)
  - Patch-analysis of forest cover (similar indices to within-stand scale analysis)