RM-CESU -Project Report, FY 08

Project Title:
Establishing permanent transects for monitoring seed dispersal by Clark's nutcrackers in relation to whitebark pine health in Yellowstone, Grand Teton, and Glacier National Parks.

Parks: Yellowstone, Grand Teton, Glacier National Parks (and Waterton Lakes)

Funding Source: Rocky Mountains CESU Technical Assistance Funding

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Project Description:
Recent studies have demonstrated declines in seed dispersal services by Clark's nutcrackers (*Nucifraga columbiana*) in whitebark pine (*Pinus albicaulis*) stands with high levels of blister rust damage and tree mortality. Glacier/Waterton Lakes and Yellowstone/Grand Teton National Parks represent two extremes on the whitebark pine blister rust infection continuum in the Rockies, with mean blister rust infection levels at 67% and 20%, respectively. Glacier, the contiguous Waterton Lakes National Park in Canada, and the Blackfeet Reservation have the highest blister rust and mortality levels known for whitebark pine. However, regions within the Greater Yellowstone Area are currently sustaining heavy whitebark pine losses to mountain pine beetles (*Dendroctonas ponderosae*). As whitebark pine stands decline, Clark's nutcrackers make fewer stand visits when seeds are ripe. However, red squirrels also harvest cones, further reducing cone availability to nutcrackers. Few to no nutcracker visits to damaged stands means reduced whitebark pine seed dispersal and regeneration, but this contention needs additional research for confirmation. The potential future absence of seed dispersal within certain park areas argues for management support for whitebark pine restoration.

The purpose of this project was to establish marked permanent transects in these five national parks to further test the hypothesis that nutcrackers make fewer seed dispersal visits to damaged whitebark pine stands. These transects are to be walked twice during mid to late July and twice again in late August/early September to obtain yearly point count data on Clark's nutcracker visits to whitebark pine stands. Subplots on these marked transects have been set up to gather stand-level data on whitebark pine health and live basal area and cone

production. In summer 2008, we established transects and subplots, and completed nutcracker point counts. We will gather data from transects in 2009 as well. Three of the four parks have indicated that they hope to continue to monitor these transects, if possible, when our study is completed.

Objectives and Methods:

The specific objectives and methods were 1) to establish in 2008 three to five permanent 2 km x 30 m belt transects through stands of mature whitebark pine in Yellowstone National Park; two transects in Grand Teton National Park; three transects in Glacier National Park, and two transects in Waterton Lakes National Parks prior to July 25, 2008. 2) In 2008, each transect was surveyed (6 point counts per transect, each separated by 200 m) for nutcrackers twice in mid-July, before seed dispersal, and again twice in late August/early September after seed dispersal began. For each point count we recorded time of day, number of nutcracker sightings, nutcracker activities, nutcracker vocalizations without sightings, and squirrel sightings, or vocalizations without sightings, all recorded for 10 minutes at each point count stop. 3) Two permanent 50 m x 10 m subplots within each transect were established at random to survey stand structure and composition, blister rust infection level and canopy damage, mountain pine beetle infestation and mortality, and whitebark pine regeneration, following methods developed by the Whitebark Pine Ecosystem Foundation. 4) For data analysis, for each transect the number of July and late August/September estimated number of cones per ha, estimated live basal area per hectare of whitebark pine, mean percent trees infected by blister rust, and mean canopy kill will be considered as independent variables, and number of nutcracker observations per hour in July and then again in September the dependent variables. For 2008, these data will be compared both among transects within a park but also across parks for general trends; they will also be compared across years to elucidate the relationship between these variables and observed seed dispersal.

Project Results:

After dialogue with Park personnel and field experience we determined that 2 km transects were too long, and we reduced them to 1 km transects—otherwise they would take us out of suitable habitat. We found only three study sites in Yellowstone NP logistically suited to this study. We successfully established 10, 1 km x 30 m belt transects through stands of mature whitebark pine in different areas in Yellowstone, Grand Teton, Glacier, and Waterton Lakes National Parks. We completed the two 50 x 10 m plot health assessments, cone counts, and first round of nutcracker point counts per transect by July 31. Final nutcracker point counts and cone counts were completed August 23 to September 2. We are currently in the process of entering data in an Excel database. We anticipate accomplishing some exploratory statistical analyses over the next few months.

The following is an overview of the data to date: The highest density of whitebark pine, living and dead occurred in Yellowstone National Park, as well as the highest cone production. The lowest density of whitebark pine occurred in

Glacier National Park, with no cone production. The highest tree mortality occurred in Grand Teton National Park and at Avalanche Peak in Yellowstone National Park. These areas also had the highest proportion of trees killed by mountain pine beetle. In contrast, both Waterton Lakes and Glacier National Parks had very high percentages of living trees with blister rust. Most of the tree mortality in these two parks was connected to blister rust. The healthiest stands of trees of all our study sites were along the Craig Pass transect. There, mortality was in the single digits, with only one tree infected by blister rust and no mountain pine beetle mortality.

During the first round of nutcracker counts, Dunraven Pass in Yellowstone National Park and Teewinot Mountain in Grand Teton had the highest nutcracker counts (highest, n = 3), with the lowest counts at Avalanche Peak in Yellowstone National Park and in Glacier National Park and Waterton Lakes National Park (n = 0 for all). During the second round of counts, Teewinot Mountain again had the highest counts (highest, n = 10). Aside from neighboring Amphitheatre Lake in Grand Teton, the transects in Glacier and Waterton Lakes National parks generally had the lowest counts (n=0).

Expected Final Report:

Final data and report expected in May, 2010.