

Electronic Supplementary Information (Figure S1: Mountain Pine Beetle-caused Mortality Rating System, Figure S2: 2018 and 2019 Landscape Assessment System (LAS) flightlines, Figure S3: Ground-verification Catchments and Associated Field-based Mortality Plots and Figure S4: Photo-inventoried Catchments, Interpolated Catchments and Fire Mortality Areas.)

Mountain Pine Beetle-caused Mortality Rating System.

O (zero) – There is no unusual mountain pine beetle mortality on the landscape. No unusual refers to landscapes that may contain the occasional red tree but there is no evidence of mortality expanding to neighboring trees (Wind River Range 2006 and 2009).



W.W. Macfarlane

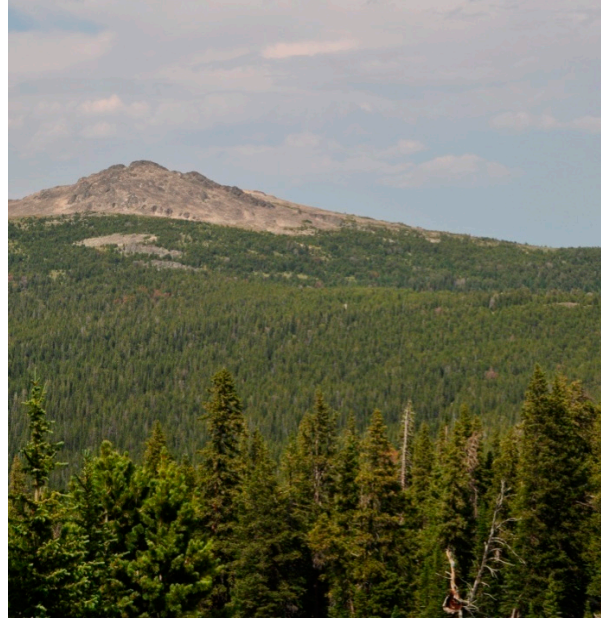


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1 (one) – There are occasional spots of red trees across the landscape but the spots do not show evidence of multi-year activity (Woody Ridge 2007; Picket Pin Mountain 2009).



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2 -2.75 --There are multiple spots of red and gray trees across the landscape and spots show two or more years of subsequent mortality. This is a growing infestation that has a high probability of developing into a coalesced outbreak if weather conditions remain favorable. The increasing magnitude of these spots is assessed with a **2.25**, **2.5** and **2.75** rating (Pack Saddle Peak 2007, Iron Mountain 2009).



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3-3.75 --There are multiple coalesced spots of red and gray trees across the landscape. This is an active, widespread outbreak. Successful, current season attacked (red) trees are obvious and widespread. Gray trees (old attacks) may also be present and mixed with the red trees (Steamboat Peak 2007; Gros Vente Range 2009). Landscapes display varying degrees of coalesce ranging from initial coalesce to almost complete coalesce and are capture with this rating system with a **3, 3.25, 3.5, and 3.75** rating.



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4 (four) – The condition of a forest during a major outbreak; complete coalesce of red trees where the vast majority of whitebark pine overstory has been killed (Teton Wilderness 2007).



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5 (five) – The condition of the residual forest after a major outbreak; gray (ghost) forests without red trees. Landscapes display varying degrees of residual green (live) overstory forest after a major outbreak. This rating system captures this variation with ratings from 5 through 5.4, depending upon the amount of remaining green whitebark pine visible. A 5.4 rating is a ghost forest where the vast majority of whitebark pine overstory is gray and dead (Avalanche Peak 2007 and Absaroka Range 2009).



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Figure S1. Mountain Pine Beetle-caused Mortality Rating System.

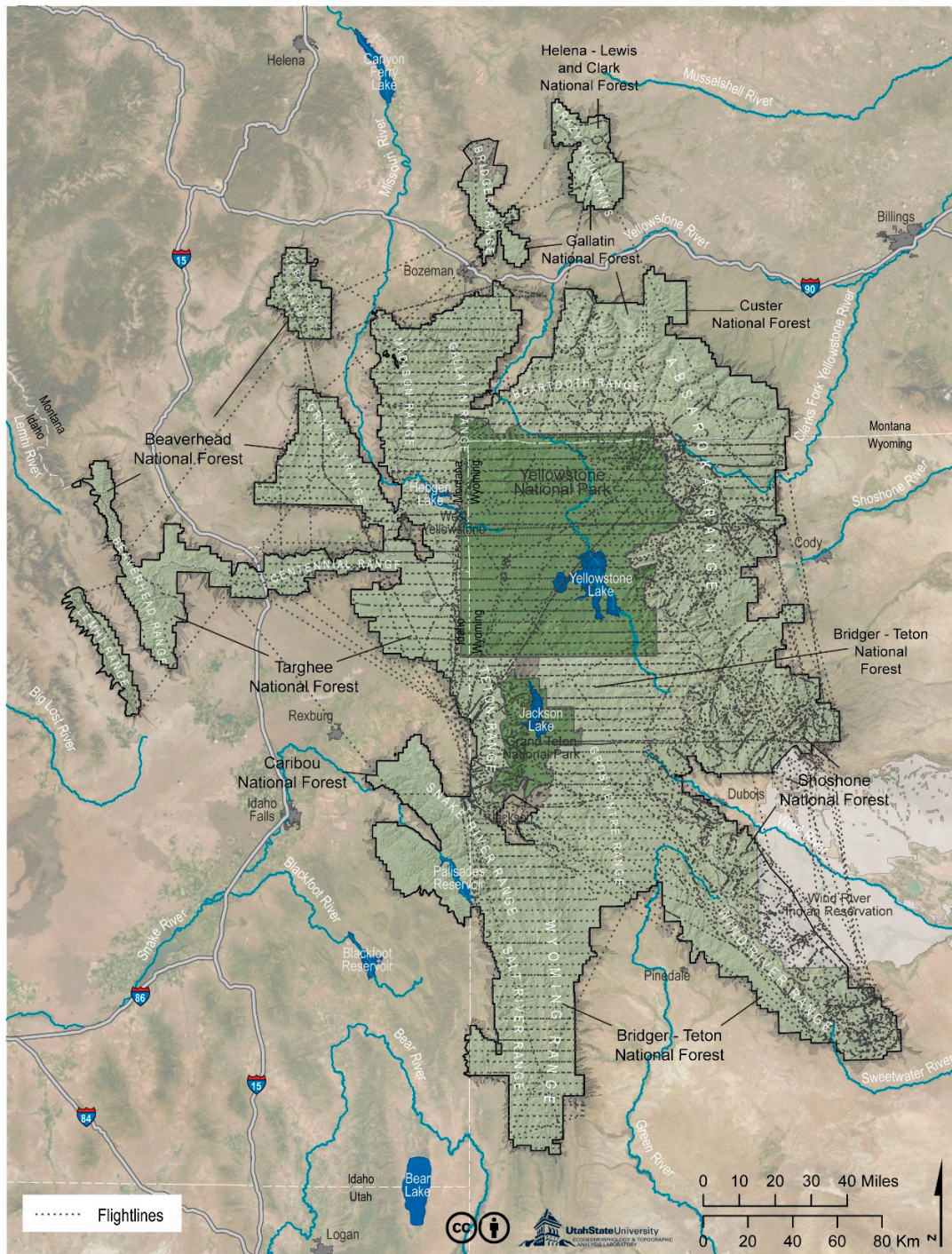


Figure S2. 2018 and 2019 Landscape Assessment System (LAS) flight line map. Displayed are the administrative areas of the GYE, and 22 major mountain ranges, the project flight lines, as a dashed black line.

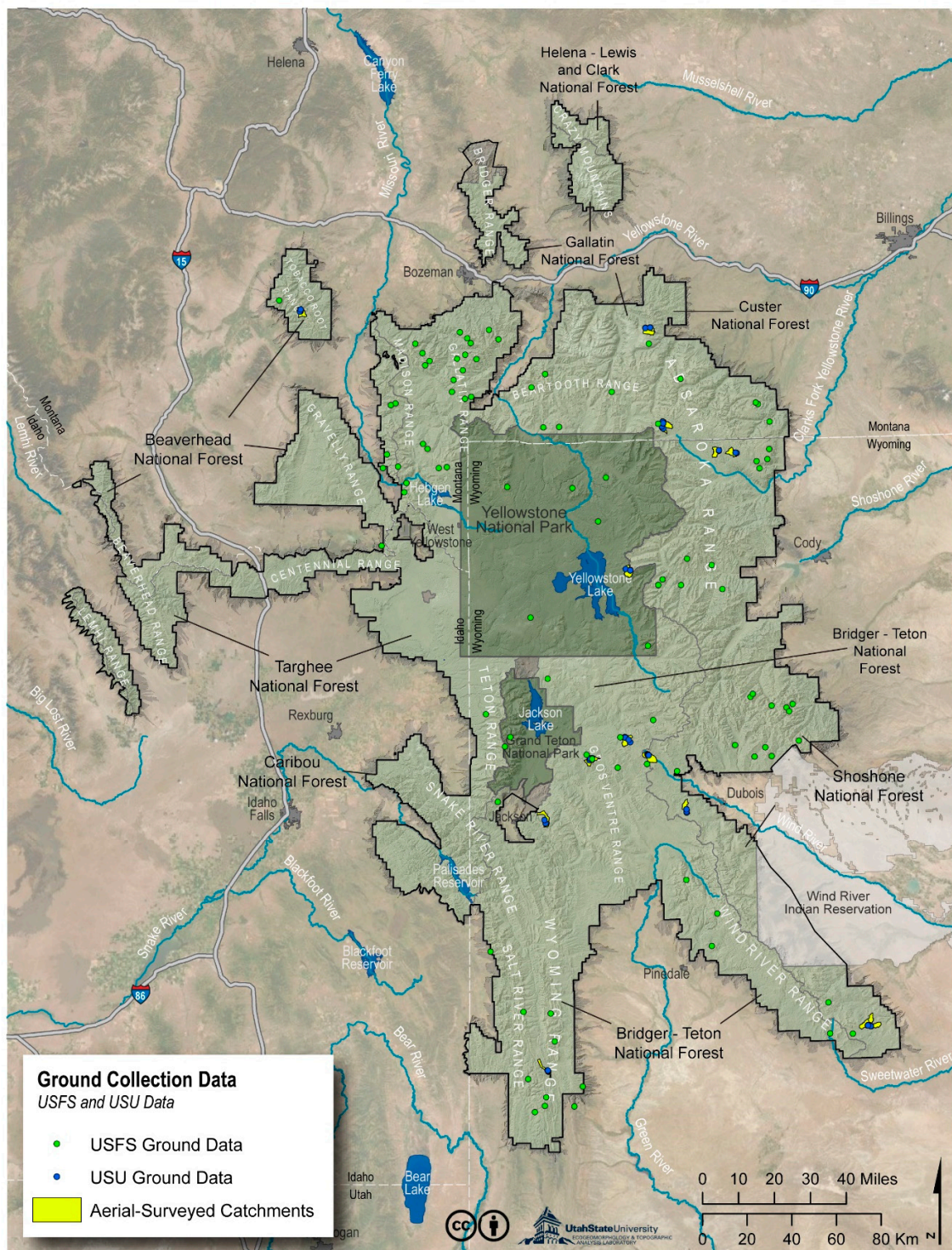


Figure S3. Landscape Assessment System (LAS) ground-verification catchments (16) and associated field-based mortality plots (150) blue points.

GYE-Wide WBP Catchments

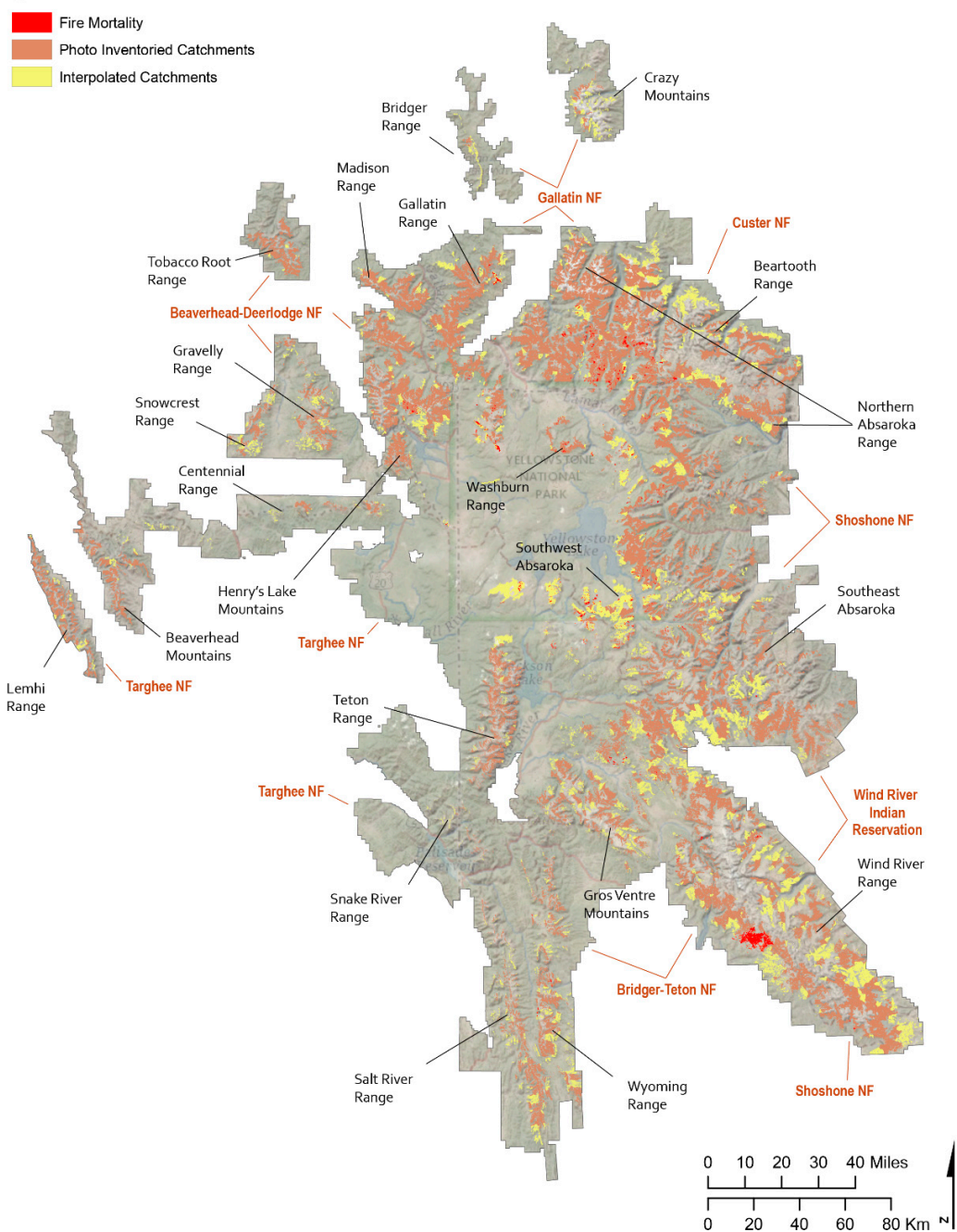


Figure S4. Greater Yellowstone Ecosystem-wide whitebark pine catchments delineated as: photo inventoried, wildfire dominated and interpolated mortality.