Watershed Scoring Methodology for High Hazard Zones

BACKGROUND

In support of the Tree Mortality Task Force (TMTF) CAL FIRE was asked to identify high hazard zones (HHZ). The initial representation of HHZ was defined solely based on proximity of tree mortality to communities and public infrastructure. To address broader concerns for forest health and wildfire risk a revised definition was developed with two tiers for HHZ.

> ***HHZ Direct (Tier 1)****: These are high hazard zones that are in close proximity to communities, roads, and utility lines. They represent a direct threat to public safety. Tier 1 HHZ is already completed and is currently available on the TMTF viewer.*
>
> ***HHZ Indirect (Tier 2)****: These are high hazard zones that are defined by watersheds (HUC 12) that have significant tree mortality, combined with community and natural resource assets. Work at the Tier 2 level supports broader forest health and landscape level fire planning issues.*

GOAL

Develop a score for each watershed that integrates the amount of tree mortality and fire risk in a watershed and evaluate this against the amount of assets (community and natural) that are found within the watershed. This creates a High Hazard Zone (HHZ) that is defined by two tiers.

ASSETS

1. Community Infrastructure – Area of buffers from roads, utility lines, and communities that are within a watershed.
   - Report acres of community asset within HHZ (direct impact) and acreage of community asset outside of HHZ (i.e. community assets without tree mortality).
2. Water Infrastructure – The amount reservoirs, hydro power, canals, and related infrastructure that are within a watershed. Runoff or recharge (optional)
3. Water Resources – The amount of meadows, lakes, and riparian areas within a watershed.

THREATS

1. Tree Mortality – Summarize the amount of tree mortality (ADS survey data) within a watershed.
   - A threshold level of tree mortality in a watershed was set at 1.5%. This value represents a natural background mortality rate. Tree mortality above the threshold represents elevated mortality. To be designated as HHZ Tier II all watersheds must be above threshold.
2. HHZ (direct) – Summarize the amount of HHZ (direct) within a watershed.
3. FRID (Fire Return Interval Departure) – Amount of departure; measured by FRID in a watershed.
4. Future Risk - Amount of projected future risk to a watershed related to tree mortality. (optional – not currently in use)
   - Water Vegetation Stress (Greg Asner data)
   - Cumulative Water Deficit (Lorrie Flint data)

METHODOLOGY

1. Summarize the identified asset and threat layers for HUC watersheds. Calculate acreage and then normalize the data. Data are binned into 3 classes (low, medium, and high).
2. Assign weighting factors for each data layer.
3. Combine asset layers into an overall asset score. The resulting asset score is grouped into low, med, high based on data distribution.
4. Combine threat layers into an overall threat score. Group into low, med, and high based on the data distribution.
5. Add result from 3 and 4 together to create an overall score (see table 1).
6. Assign watershed designation.
    a. Use categories: low, med, and high with management emphasis:
        i. Low – represents a low impacted watershed; operate only in HHZ (direct)
        ii. Med – moderately impacted; operate in HHZ direct and HHZ indirect
        iii. High – highly impacted; operate in HHZ direct and HHZ indirect
    b. Watersheds with an overall score of 4 and above are combined into a single class that are designated HHZ (Tier II).

Table 1. Watershed Scoring Matrix

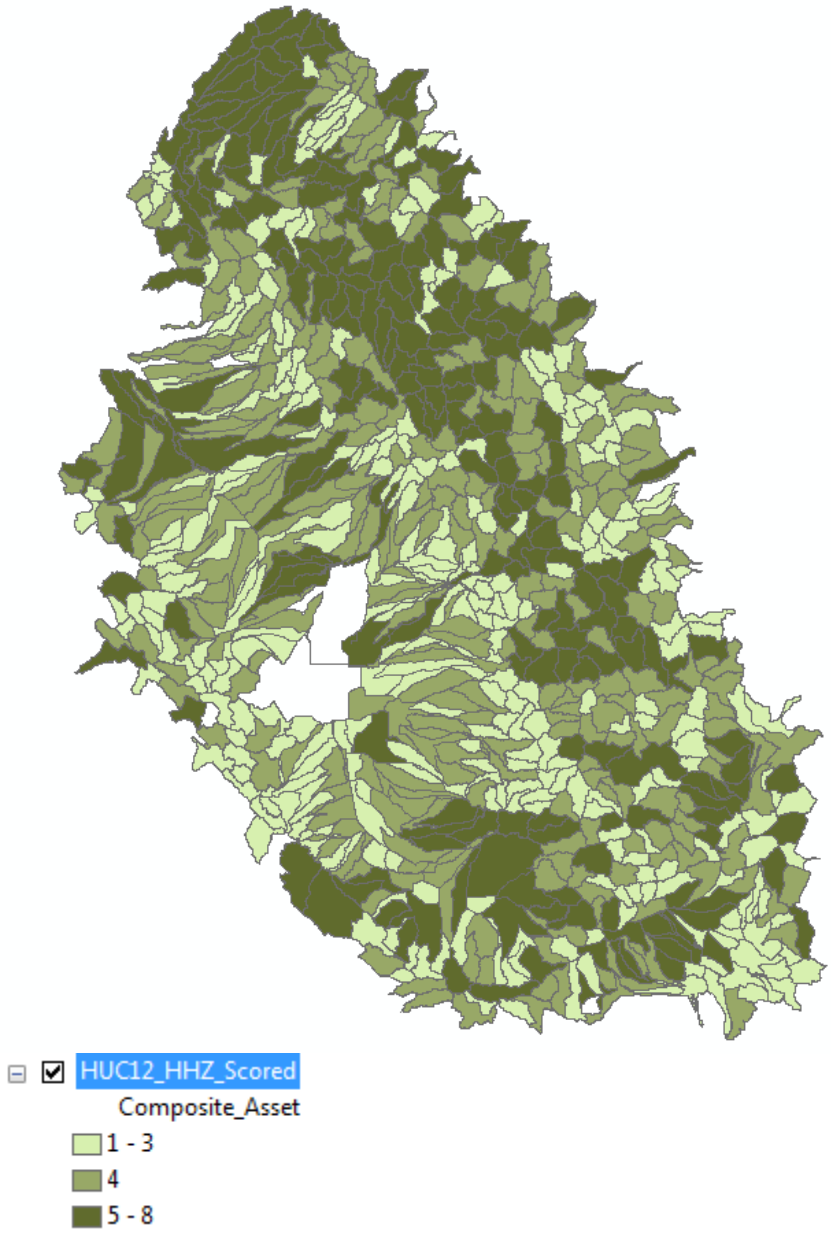
Description	**Asset Composite Score**	**Threat Composite Score**	**Overall Score**
Low	1	1	2
Med-Low	2	1	3
Low-Med	1	2	3
High-Low	3	1	4
Low-High	1	3	4
Medium	2	2	4
Med-High	3	2	5
Med-High	2	3	5
High	3	3	6

Appendix 1 – Watershed Scoring

Composite Asset Score

Add each asset layer: community infrastructure, water natural resources, water infrastructure

[Asset_BufferedCI_Score] + [Asset_WaterNature_Score] + [Asset_WaterInfra_Score]

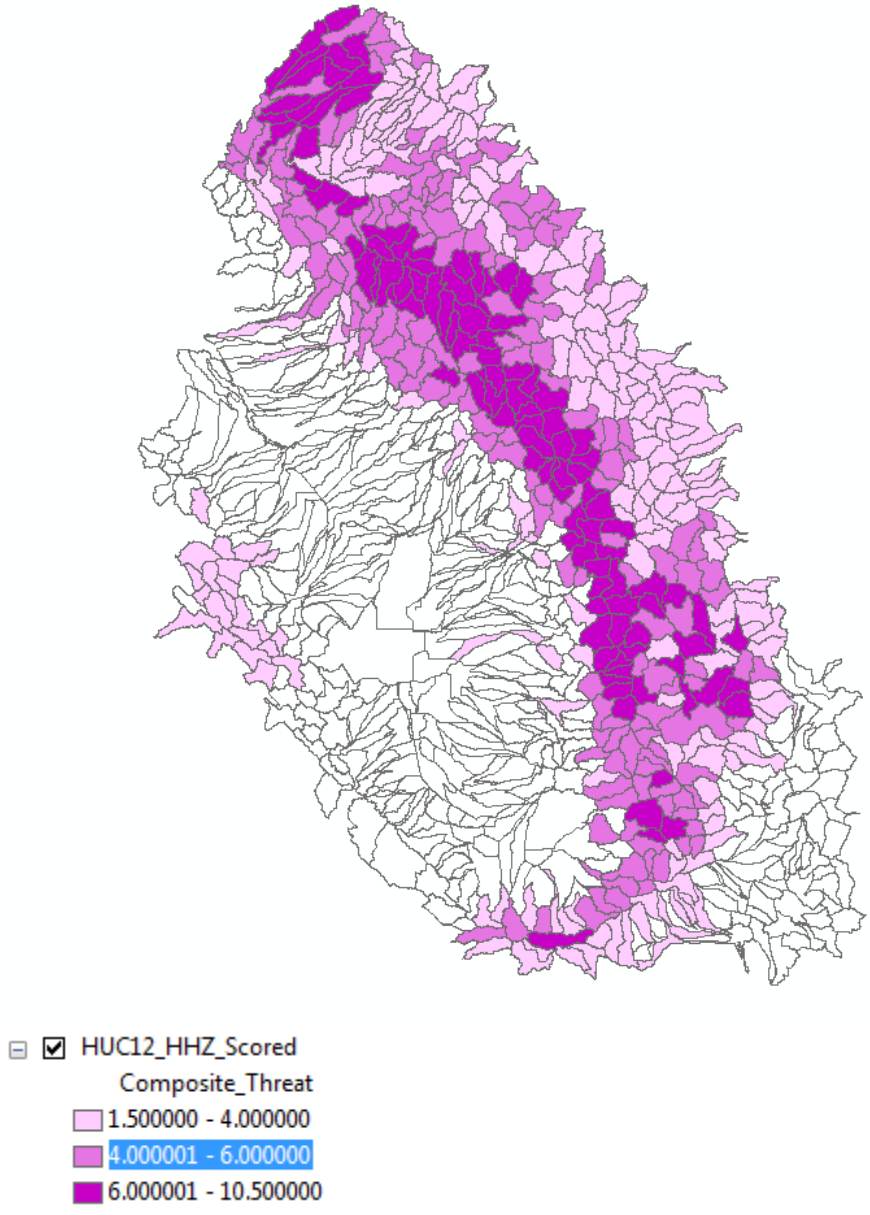


Composite Threat Score

Add threat layers: tree mortality, amount of direct HHZ (Tier 1), and Fire Return Interval Departure (FRID). Where there is no mortality the Composite Threat Score is automatically 0.

Threat_DeadTrees<>0,

(1.5*[Threat_DeadTrees_Score])+ [Threat_HHZ_Score] + [Threat_FRID_Score]



Overall HHZ Watershed Score

Combine asset and threats to produce an overall watershed score. Scores of 4, 5, and 6 represent medium and high values that represent Tier 2 HHZ.