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Interpreting Multiple Critical Load Exceedances

The critical loads air quality assessment may show that more than one CL is in exceedance. Each CL describes the sensitivity of a different component of the environment, and when viewed together, they represent the continuum of effects that can occur in an ecosystem. This document provides information on how to combine information on the extent, severity, and reliability of multiple CL exceedances, as determined in Step 6 of the CL Implementation Strategy, and how to decide which CLs will be used to develop target loads.

Guiding principles for interpreting multiple CLs (see CL Implementation Strategy Step 6 and CL Exceedance Metrics Protocol for background information):

- Focus on the most reliable CLs exceedances.
- Use the combination of extent, severity, and reliability of the exceedances to inform the decision whether to identify target loads
- Remember that less reliable CLs can provide valuable information to guide monitoring strategies.
- If specific instructions for open-ended terms are not provided, use your professional judgment. Please feel free to direct questions to the Chair of the Deposition Focused Air Resource Management Team, listed on the Contacts Page.

Three example scenarios with multiple critical load exceedances are provided below with suggestions to guide interpretation.

1. Exceedance of CLs of acidity for both surface waters and forested ecosystems.
    - Consider whether any CL exceedances overlap spatially. Overlap is possible with CLs of acidity because both CLs are influenced by the watershed soil chemistry and geology.
    - Focus on the CL that is most reliable; in the case of the national data provided on the Air Quality Portal, it would be surface waters.
    - Consider the extent and severity of the exceedance of the most reliable CL.
        - Proceed to the Target Load Strategy when extent and severity of the exceedance is moderate to high for a reliable CL.
        - If the extent and severity of the exceedance is small for a highly reliable CL, further monitoring might be the best option prior to setting a target load. For example, when only a few surface water sites have been monitored on a Forest and these sites show exceedance of the CL, the Forest may want to gather chemistry data from more streams/lakes before making a target load decision.
    - A less reliable CL exceedance (in the case of the national data provided on the Air Quality Portal, this would be CLs of acidity for forested ecosystems) can be used to help identify areas where further environmental measures, such as water and/or soil chemistry, should be taken *(see Monitoring Strategy for more details).*

2. Exceedance of CLs of acidity for surface waters and CLs of nutrient nitrogen.
    - Consider whether the CL exceedances overlap spatially.
    - Determine the reliability of all the CLs exceedances. It is possible that you could have two or more reliable CLs (surface waters and lichens in the Sierras, for example).
    - Consider the extent and severity of the CL exceedances.

    - Proceed to the Target Load Strategy when extent and severity of the exceedance is moderate to high for a reliable CL.
    - Recognize that multiple CLs and pollutants can be used to develop target loads. For example, in the East where surface water acidification is usually driven by sulfur, it might be appropriate to identify a TL for S related to acidification and a TL for N representing one or more of the N CL receptors. In the west, where S impacts are generally low, two N CLs might be identified, one related to acidification effects and one based on nutrient nitrogen effects. The Target Load Strategy will discuss further how the Forest would use this information to develop a TL.
    - If the extent and magnitude of the exceedance is small for a highly reliable CL, further monitoring might be the best option prior to moving forward with developing a TL.
  - A less reliable CL exceedance can be used to help identify areas where further environmental monitoring, such as water and/or soil chemistry, should be implemented *(see Monitoring Strategy for more details).*

3. Exceedance of multiple CLs of nutrient nitrogen.
   - Determine the reliability of the CLs for your Forest following the "User's Guide for setting empirical critical loads for nutrient nitrogen".
   - Consider the extent and severity of the CL exceedances.
     - Proceed to the Target Load Strategy when extent and severity of the exceedance is moderate to high for a reliable CL. Recognize that multiple CLs can be used to develop target loads. The Target Load Strategy will discuss further how the Forest would use this information to develop a TL.
     - If the extent and magnitude of the exceedance is small for a highly reliable CL, further monitoring might be the best option prior to moving forward with developing a TL.
   - A less reliable CL exceedance can be used to help identify areas where further environmental monitoring, such as water and/or soil chemistry, should be taken *(see Monitoring Strategy for more details).*