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Research Brief for Resource Managers

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Wildfire and the recovery of southern California Steelhead

Mark H. Capelli. 2023. The role of wildfires in the recovery strategy for the endangered southern California steelhead in Florsheim, J.L. O'Dowd, A.P., and Chin, A., eds. Biogeomorphic Responses to Wildfires in Fluvial Ecosystems: Geological Society of America Special paper 562.
http://doi.org/10.1130/2024.2562(06).

The federally listed endangered southern California steelhead (*Oncorhynchus mykiss*) occupies wildfire-prone watersheds from the Santa Maria River in Santa Barbara County to the Tijuana River at the U.S.-Mexico border. This landscape is characterized by a Mediterranean climate, high erosive soils, and a fire-dependent chaparral/coastal sage scrub-dominated plant community. Post-wildfire processes help to create and maintain essential features of the species' freshwater habitats, such as boulder-forced and step pools, which provide oversummering rearing habitats, and spawning gravels, which are essential for reproduction.

Disturbance events associated with wildfires such as debris flows, and accelerated sedimentation and deposition can temporarily render steelhead spawning and rearing habitats inaccessible or unsuitable for the freshwater reproductive phase of the steelhead life-history. Even absent large debris flows, wildfires followed by prolonged droughts, coupled with small-magnitude storms, can compound the adverse effects to steelhead and steelhead habitats. Small storms with capacity to move small sediment through the stream channel network, and limited capacity to flush accumulated sediments from pools and riffle habitats, can prolong the period required to reestablish steelhead habitat conditions suitable for spawning, rearing and oversummering refugia.

Management Implications

- Core recovery populations should be distributed throughout the natural spatial range of the species.
- Include both large inland and small coastal watersheds to preserve natural diversity of habitats and selective pressures.
- Ensure volitional fish passage throughout the watershed, but particularly to habitats providing suitable over-summering rearing conditions.

These disturbance events have been more frequent, intense, and extensive as a result of anthropogenic climate change and the increased extent of the urban-wildland interface, including within the four national forest of southern California (Los Padres, Angeles, San Bernardino, and Cleveland).

The long-term viability of southern California steelhead populations requires that they be able to persist under the foreseeable natural disturbance regime characteristic of southern California. To ensure the survival of at least one viable steelhead population in each of the five biogeographic population groups (BPG) that comprise the Sothern California Steelhead

Recovery Planning Area during a catastrophic post-wildfire sedimentation event, two criteria must be met: 1) the number of viable populations in each BPG should exceed the number of wildfires expected in a catastrophic wildfire season; and 2) wherever possible the populations should be spatially separated by a distance sufficient to prevent a wildfire or post-wildfire disturbance event from extirpating more than one viable population in a BPG. To determine the level of redundancy and spatial separation of populations necessary to withstand wildfire and associated post-wildfire disturbances the National Marine Fisheries Services (NMFS) Technical Recovery Team (TRT) estimated the expected geographic extent of a wildfire (or a series of wildfires within a single year) with a 100-yr recurrence interval, based on historical wildfire data from 1910 through 2003. From this analysis the TRT determined that the minimum spatial separation criteria between core recovery populations was estimated to be 68 km.

A refined wildfire-frequency and burn-area analysis reflecting future conditions could initiate a reevaluation of the criteria for redundancy and spatial distribution; however there are limits to the number and spacing of core recovery populations that are possible within the Southern California Steelhead Recovery Planning Area. Further, many of these spawning, rearing, and oversummering areas are located in the upper reaches of watersheds, which are currently not accessible to upstream migration of steelhead because of dams and other fish passage impediments. Restricted access to major portions of the core recovery watersheds compounds the threats posed by wildfire and large postfire disturbances to the recovery of southern California steelhead.

Additional resiliency to the threats identified in NNFS' wildfire analysis could be achieved by removing or modifying the numerous fish passage barriers (e.g., dams, diversion, road crossings pipelines, flood-control structures, etc.) that impede or block access to upstream spawning, rearing and oversummering steelhead habits, particularly those that affect access to the protected habitats within the four U.S. national forests in southern California. Wildfire, along with its potential postfire geomorphic disturbances now plays outside role in the life-history of this species. The recovery strategy developed by NMFS is aimed to maximize the potential for the recovery and persistence of southern California steelhead by expressly taking into account the ecological and evolutionary role of wildfires.

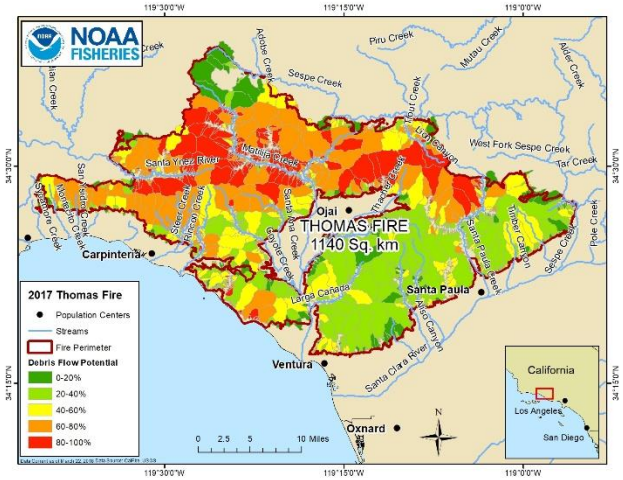

Figure 1. Thomas Fire and debris-flow potential within the Monte Arido BPG. The 2017 Thomas Fire affected steelhead habitats in three of the four core recovery populations: Santa Ynez River, Ventura River, and Santa Clara River.

Suggested Reading:

Boughton, D. A., Adams, P.B, Anderson, E.C., Fusaro, C. Keller, E.A., Kelley, E., Lentsch, L., Nielsen, J.L. Perry, K., Regan H.M., Smith, J.J., Swift, C.C., Thompson, L, and Watson, F. 2006. Steelhead of the South-Central/Southern California Coast: Population Characterization for Recovery Planning: National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NBMFS-SWFSC TM-394 129 p.

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