Rejuvenation of Fire-Dependent Rare Plants

Responses of *Hesperocyparis bakeri* and *Iliamna bakeri* to the 2014 Eiler Fire and Management Implications

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HISTORY

The Cypress Plantation, in Shasta County, was established in a century-old brushfield in 1936. At that time, montane chaparral contained inclusions of Baker cypress (*Hesperocyparis bakeri*), a rare tree with serotinous cones that is known from just 11 occurrences in California and Oregon. The site was burned, stripped, and windrowed to prepare the area for planting with ponderosa and Jeffrey pine.

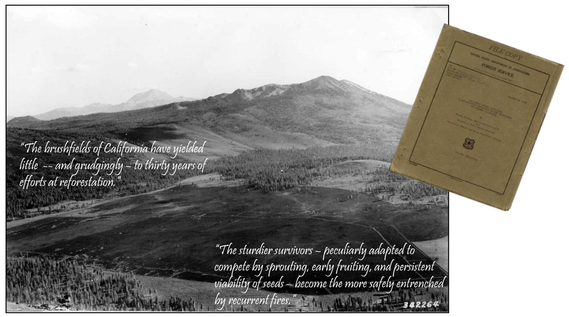

Fig. 1: Cypress Plantation as seen from Burney Mountain, looking toward the 1000 Lakes Wilderness, with Mt. Lassen in the background. Image and quotes from 1939 report on reforestation experiments within the plantation.

Fig. 2 (left): Burning the plantation in 1936.

Fig. 3 (right): Stripping the plantation of shrubs in 1936.

As of 2014, plantation pines averaged 10-14" dbh. Thick cover of six-foot-tall montane chaparral was present throughout the plantation understory.

Baker cypress stands were distributed across the plantation, occurring in long thin strips along windrows, as dense stands on rocky outcrops and thin soils, and as scattered individuals overtopped by pine trees.

Fig. 4: Baker cypress tree amidst pine and chaparral.

EILER FIRE EFFECTS

The Eiler Fire burned in summer 2014 across 14,526 acres of the Lassen N.F., including 172 acres of Baker cypress within the Cypress Plantation. Post-fire surveys found that 77% of the cypress burned at high severity. These areas experienced close to 100% overstory and understory mortality.

Fig. 5: Dense stand of Baker cypress with 100% overstory mortality and understory consumption.

Fig. 6: Cypress Plantation photopoint, 2013 (pre-fire). Baker cypress tree is overtopped by pines.

Fig. 7: Cypress Plantation photopoint, 2014 (post-fire) showing effects of high severity fire.

Fig. 8: Time series of aerial imagery (l-r): 1939 (plantation 3 years old), 2012 (pre-Eiler Fire), 2015 (post-Eiler Fire), 2015 with cypress distribution (white) overlaid on RAVG fire severity imagery for the LNF, where dark red indicates highest fire severity value.

RARE PLANT RESPONSES

Hesperocyparis bakeri

Where flame lengths reached the canopy, the serotinous cones of Baker cypress opened, releasing seed at the same time that fire had prepared a bare mineral seedbed. Germinating seedlings were first observed in April 2015, and had grown to 4"-6" by late summer.

Fig. 9: A fire-killed Baker cypress, showing the thin bark characteristic of the species.

Fig. 10: Large, fire-killed Baker cypress tree where flames reached the canopy.

Fig. 11 (top): Heat-opened Baker cypress cones.
Fig. 12 (bottom): Dense patch of Baker cypress seedlings.

Iliamna bakeri

A mallow was observed emerging from rocky, thin soils in the understory of a dense Baker cypress patch. It was identified as Baker's globe-mallow (*Iliamna bakeri*), a rare forb that germinates in response to fire.

Fig. 13: Seedlings of Baker's cypress and Baker's globe-mallow

Fig. 14: Baker's globe-mallow in understory of Baker cypress stand.

Fig. 15: Baker's globe-mallow and Baker cypress in high severity burn.

Fig. 16: Baker's globe-mallow in flower.

MANAGEMENT

The Eiler Fire resulted in high levels of standing dead fuels throughout the site (see Fig. 7). While Baker cypress is fire-dependent, a subsequent fire occurring before the next generation of trees grows to cone-bearing age could eliminate the species from portions of the landscape.

The Eiler Fire Salvage and Restoration Project (Hat Creek R.D., Lassen N.F., 2015 decision) will:

- Mechanically treat the standing dead fuels adjacent to Baker cypress stands and isolated trees.
- Exclude post-fire fuels treatments from Baker cypress stands due to widespread cypress regeneration.
- Not re-establish a pine plantation in this area, thus restoring the montane chaparral-Baker cypress mosaic to the landscape.
- Plant Baker cypress in areas that contained cypress in the 1930s, but had no mature Baker cypress trees present prior to the Eiler Fire.

MONITORING

Fig. 17: Field crews monitor Baker cypress regeneration.

Fig. 18: A bee of genus *Diadasia* visits Baker's globe-mallow.

In 2015, monitoring plots were established to answer the following questions:

Baker cypress

- Identify factors that influenced post-fire regeneration of Baker cypress, including fire severity and pre-fire stand conditions such as cypress density
- Determine how post-fire conditions, such as shrub and overstory canopy cover, influence Baker cypress seedling survival over the long-term

Baker's globe-mallow

- Determine how long plants persist on the landscape following a fire event
- Identify additional pollinators for this species