

Vision Fire 10 Year Anniversary Fact Sheet #2 – Post-fire Research on the Ecological Effects of the Vision Fire

The Vision Fire was a significant ecological event. Research and monitoring in the burn area resulted in new insights about the Point Reyes ecosystem, and how it is affected by wildland fire.

The ecological effects of major disturbance events such as wildland fires, floods, or oil spills can only be evaluated if a baseline inventory of pre-disturbance conditions exists. Fortunately, many pre-fire surveys had been done which allowed a comparison of pre and post fire conditions.

Key research findings:

- Northern Spotted Owls were not significantly effected by the Vision Fire because their nest sites are generally on south-facing slopes, and the fire mostly effected west-facing slopes.
- The Vision Fire exposed the burrow openings of the Point Reyes Mountain Beaver, allowing more accurate population counts of this unique sub-species of primitive rodent.
- The post-fire survival rate of mountain beavers throughout the burn area was very low, only 0.4-1.2%, and it is projected to take up to 20 years post-fire for full recovery of the population.
- The rush-rose (*Helianthemum*), a plant previously unknown in the Seashore, was abundant after the fire, interspersed with *Lotus* plants in the early phases of regeneration.
- A new moth species (*Mompha* sp.) was discovered when its larvae were found feeding on the seeds of the rush-rose.
- The root fungus community on the Bishop pine seedlings was entirely different than that on the mature trees. This indicated a sporebank that survived the fire, and may have been left in the soil by the last large fire.
- The ash after the fire raised the pH of the soil, which increased nutrient availability.
- Nesting success of songbirds was greater in the burned area than in similar areas outside the burned area.
- Non-native Australian fireweed was the most common weed found invading the burn area as well as firelines and other areas disturbed by suppression activities.
- Hydrophobic (water repellent) soils occurred in the burn area caused by a waxy layer in the soil left from vegetation that burned. (Waxes in leaves help plants retain moisture which is an adaptation to the dry summers in the Mediterranean coastal climate.)
- The first wet season after the fire, hydrophobic soils contributed to increased runoff of 42%, considerably higher than a non-burn norm of 10%.
- Lotus and lupine were early colonizers of the burn area followed by ceanothus
- Rare marin manzanita became much more widespread after the fire

- Most of the vegetation cover after year 2 was composed of three nitrogen-fixers (lotus, lupine, ceanothus).
 - Bishop pine exhibited cone production by year 5, which was 5 years earlier than previously reported.
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Northern Spotted Owls

- Northern spotted owls are listed as a federally threatened species
- Surveys had been conducted before the fire from 1988-1991
- National Park Service surveys were conducted immediately following the fire (1995) and during the following spring and summer (1996) by biologist, Nola Chow, and NPS Science Advisor, Sarah Allen
- In 1996, all nest sites known from previous surveys were occupied during the breeding season
- Preferred roost and nest sites were demonstrated to have higher amounts of duff cover and canopy cover, on south to southeast facing slopes
- Most of the habitat burned was on west facing slopes, so there was very little impact from the fire on northern spotted owls
- The study showed that the diet of northern spotted owls in and around Point Reyes National Seashore consists primarily of woodrats, in both bishop pine and douglas-fir forests

Point Reyes Mountain Beaver

- Gary Fellers, USGS biologist with the Western Ecological Research Center, Point Reyes Field Station, led a research and monitoring effort to assess the effects of the Vision Fire on the Point Reyes mountain beaver
- Pre-fire surveys were conducted 1984-1994; immediate post-fire surveys were conducted 1995-1996; ongoing monitoring was conducted 1996-2000
- Mountain beavers are a primitive species of rodent, thought to represent one of the most ancient lineages of living mammals
- The Point Reyes mountain beaver is a distinct subspecies that lives in underground burrows, found primarily in dense thickets of mature coastal scrub on moist, north facing slopes
- Prime habitat for Point Reyes mountain beavers consists primarily of coyote brush, coffeeberry, poison oak, and sword fern, as well as bracken fern, California nettle, and cow parsnip.
- Based on pre-fire monitoring data, it was estimated that the Vision Fire burned approximately 60% of the Point Reyes mountain beavers' existing habitat
- The fire exposed the burrow openings, allowing much more accurate population estimates to be made.
- A survey immediately after the fire counted 18 mountain beavers in an area estimated to have supported 2,500 mountain beavers before the fire
- The post-fire survival rate throughout the burn area was very low, only 0.4-1.2%
- The first phases of post-fire vegetation were mats of low lying ground cover such as blackberry, replaced in large areas by rapidly growing blue-blossom ceanothus.
- The vegetation is expected to take 15 to 20 years to return to the mature coastal scrub community which supports mountain beavers.

Lepidoptera (Butterflies and Moths)

- Jerry Powell, UC/Berkeley, Professor Emeritus of Insect Biology studied the survival and recovery of moths and butterflies during the 5 seasons after the Vision Fire.
- 602 species (40 butterflies and 562 moths) had been recorded in the Inverness Ridge area over a 50+ year period before the fire; 376 species were recorded within the fire perimeter, during the first 5 years after the fire
- larvae were found for 31% of the 376 species observed, indicating these species were breeding in the burn area
- within five years, 92% of species associated with riparian (stream side) vegetation were recovered; 76% of the species associated with chaparral and grassland recovered; and 61% of species associated with the bishop pine community recovered.
- Two native butterflies, orange sulphur, and acmon blue, were abundant in association with the ground covering *Lotus* plants which colonized the burn area after the fire; these began to decline as the *Lotus* was replaced by bishop pine and marin manzanita
- Nettle was abundant in riparian canyons for the first two years, associated with 4 butterfly and moth species; these species declined as the nettle was replaced by alders
- A tiny black moth, a species of *Mompha*, previously unknown in the Seashore, was observed in abundant numbers, associated with a plant, *Helianthemum (rush rose)*, which was also previously unknown in the Seashore. This species of *Mompha* turned out to be undescribed, (previously unknown to science).
- *Helianthemum* formed extensive patches interspersed by *Lotus* in the burn area. *Mompha* larvae were found eating its seeds.

Bishop pine

- Professor Thomas Bruns, UC Berkeley, has studied root fungi (mycorrhizae) associated with Bishop pine in the Limantour road area since 1991.
- The root fungus species growing on the young Bishop pine seedlings proved to be a different community than those growing on the mature trees.
- As a result of the fire, "It went from a community dominated by *Tomentalla sublimilacina*, *Russula* and *Lactarius* species to one dominated by *Rhizopogon*, *Wilcoxina*, and *Tuber* species (Bruns, et. al., 2000)." This research demonstrated the extent of the sporebank that survived the fire and provided the pioneer root fungus species.
- Another research effort focusing on the Bishop pine response to the Vision Fire examined the effects of ash on the nitrogen cycling. Two sites in the burn area were compared, one where the ash was removed and one in where the ash was left.
- "...the ash was shown to stimulate primary production and ecosystem nitrogen retention through direct nitrogen inputs from ash to soils as well as indirect ash effects on soil nitrogen availability to plants (Grogan, Bruns & Chapin, 2000)." The ash was also shown to significantly elevate soil pH from 4.6 to 5.2 in December, 1995 and from 5.1 to 5.4 in May, 1996.

Songbirds

- Thomas Gardali and Geoff Geupel, Point Reyes Bird Observatory led an investigation of the effects of the Vision Fire on songbirds in the burn area.
- Nesting success was shown to be greater in a burned site, Muddy Hollow, at 64%, compared to at two unburned sites, Olema Creek, 29%, and Lagunitas Creek, 19%.

- There were fewer Pacific-slope Flycatchers and Chestnut-backed Chickadees in burned sites.
- There were more Song Sparrows, Allen's Hummingbirds, Orange-crowned Warblers, and Bewick's wrens in burned sites. These species are associated with forest understory, and benefited from the more abundant shrub layer after the fire.
- Abundant seeds available after the fire benefited the American Goldfinch.
- Allen's hummingbirds benefited from the abundant nectar in post-fire vegetation, especially hedge nettle and bee plant.
- There were patches of nearly unburned riparian vegetation within the fire perimeter. In the weeks immediately after the fire, these patches were inundated with birds, many displaced from their typical habitat. The patches included species associated with coastal scrub (e.g. wren tits, white-crowned sparrows), Bishop pine forest (e.g. nuthatches, woodpeckers) and even marshes (e.g. yellowthroats, marsh wrens).
- It is speculated that there may have been less predation due to less predators in the area after the fire, and denser shrub cover which may have better concealed birds from predation.

Watershed

- Geomorphologist Laurel Collins led a research effort on the effects of the Vision Fire in the Muddy Hollow Watershed.
- Seasonal rainfall following the fire was slightly above average at 38.15 inches. Hydrophobic soils contributed to increased runoff of 42%, considerably higher than a non-burn norm of 10%.
- By the second year, the hydrophobicity had disappeared, and burned trees whose roots had decayed, began to fall. "In some 500 ft-long reaches, within the abandoned reservoirs, an average of one fallen tree exists per every 6 feet of channel."
- By 2000, the sediment supply was greatly diminished, correlating to the recovery of vegetation (Collins, 2000).
- During the fire, a thin layer of ash was deposited on the alluvial fan at the mouth of Muddy Hollow Creek. After the first winter, 6 inches of granitic sediment had been deposited over the ash. During the second winter, the sediment deposited was much siltier, due to more erosion in the middle reaches (Collins, 2000).

Vegetation

- Professor Barbara Holzman, San Francisco State University, collected vegetation data from the burn area in 1996 and 1997
- Approximately 85% of vegetation cover after year 2 was composed of three nitrogen-fixing plants (lotus, lupine, ceanothus).
- Bishop pine exhibited cone production by year 5, which was 5 years earlier than previously reported.
- Invasive non-native Australian fireweed increased initially, and spread widely, but eventually declined as it became shaded out.

To review the complete research papers, please visit www.nps.gov/pore/fire and go to the 1995 Vision Fire link.

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