



Presentation Item 10

Report on Benthic Macroinvertebrate Studies in the Carmel River

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Staff Contact: Beverly Chaney






■ Ten-Year Summary of the Monterey Peninsula Water Management District's Bioassessment Program on the Carmel River

Prepared For: Monterey Peninsula Water
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Prepared By: J. Thomas King
BioAssessment Services
Folsom, CA



Rapid Bioassessment

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- In 2000 the District initiated a bioassessment monitoring program to:
 - Evaluate the water quality and physical habitat conditions of the Carmel River,
 - Establish baseline information that may be used in conjunction with other water quality programs,
 - Assess potential effects of future land and water use activities and
 - Supplement and complement the ongoing surface water quality sampling program and fisheries management efforts.


- Six primary sites were selected from above Los Padres Reservoir, in the Ventana Wilderness, to mid-Carmel Valley, near Safeway, including several sites directly below the two reservoirs.
- Sites were primarily selected to correspond to the District's annual steelhead population surveys.



Monterey Peninsula Water Management District
 Bioassessment Monitoring Stations
 Within the Carmel River Watershed



Rapid Bioassessment

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- California Stream Bioassessment Procedure (CSBP) (CDFG, updated 2003).
 - the CSBP is required by the State Water Resources Control Board - Division of Water Quality, and Regional Water Quality Boards for discharge permits, etc.
 - Sites were sampled each fall and samples were sent to the lab for identification.
 - 15 physical/habitat parameters were measured and the sites scored.
 - 19 biological factors (metrics) were used to describe Benthic Macro Invertebrate (BMI) assemblages and relative site quality.

Benthic Macroinvertebrates (BMI)

Why BMI?

- BMI = invertebrates that live in streambeds, large enough to see with naked eye (> 0.5 mm).
- Important as an indicator of water and habitat quality.
- Relatively easy to collect and ID. Useful for comparing sites over time and space.
- Diversity of species responsive to stream conditions ranging from healthy to degraded.
- Primary food source of juvenile steelhead.

Caddisflies



Ochrotrichia sp. (caddisfly)



Wormaldia sp. (caddisfly)



Micrasema sp. (caddisfly)

Mayflies



0 |-----|-----|-----| 3 mm

***Baetis* sp. (mayfly);**
Carmel R. Spring 2003



***Tricorythodes* sp. (mayfly);**
Carmel R. Spring 2003

Miscellaneous BMI



Simulim sp. (black fly)



Hyalella sp. (scud)



Orthocladiinae (midge)

BMI in-situ





10-Year Findings

1. There are strong and consistent effects of the dam / reservoir systems on downstream BMI assemblage quality.
 - Likely factors include:
 - Elevated water temperature and larger substrate size at sites immediately downstream of the reservoirs
 - Relationship to other possible factors including altering fluvial processes, material transport, flow, and food supplies were inconclusive.
2. Urbanization effects on Carmel River BMI assemblage quality were of less magnitude when compared to reservoir effects.
 - The lowest elevation monitoring site (Mid-Valley) had the highest BMI abundance and biovolume of all sites as well as supporting many sensitive species.

10-Year Findings



3. The reference site above LPR (located in the Los Padres Nat. Forest) had the highest average IBI (index of biotic integrity) value, the most balanced distribution of functional feeding groups, and the highest average abundance of intolerant organisms and taxa.
4. The Sleepy Hollow Steelhead Rearing Facility's rearing channel had similar BMI assemblage quality compared to the two sites immediately downstream of the reservoirs.
5. The Carmel River BMI taxa provide a readily available food resource for salmonid populations. These taxa include baetid mayflies, black flies, and midges. These findings were similar to those from a 1982 Carmel R. study.


Trends



- There were downward trends in BMI assemblage quality at two successive sites downstream of San Clemente Reservoir, possibly in response to the annual drawdowns of the reservoir.
- No upward or downward trends at the other sites throughout the monitoring period, more variable.
- There was a large decline in BMI assemblage quality at all sites in 2007, a critically dry water year, particularly the reference site above LPR.
- Full recovery occurred at the reference site the following years despite the Basin Complex Fire in 2008.



Report Recommendations

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1. Change the bioassessment methods from the CSBP to the new SWAMP procedure (Surface Water Ambient Monitoring Program) for more robust data from a greater range of habitats.
 2. Establish at least one additional reference site above LPR or an upper tributary to sample a greater diversity of theoretically pristine, control conditions.
 3. Conduct a special study to determine the effects of substrate composition on BMI assemblages upstream and downstream of the reservoir systems.
 4. See the MPWMD web page to download the full report for more details.