

Documenting Stream Corridor Conditions: A New Approach for Showing Changes Related to Instream Flow and Other Habitat Management Issues in Hawaii.



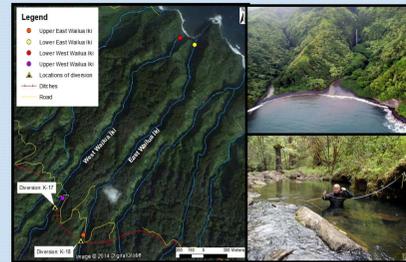
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1. Background

Documenting habitat availability, species' use, and overall habitat suitability is fundamental to developing appropriate responses to many management issues including instream flow determinations. Yet, traditional methods (transect-based habitat surveys and snorkel-based visual fish observations) were time-consuming, covered small areas, required experienced surveyors, and limiting in the types of habitats that could be sampled. As a result, surveys were usually focused on a few high priority locations and most streams had little up-to-date information available. A new approach was needed that was less costly, faster, and more broadly applicable to management issues.



Traditional Instream Flow monitoring stations in lower and upper reaches of West and East Wailua Iki Streams.

3. High Definition Fish Surveys

We used the High Definition Fish Survey (HDFS) technique with geo-referenced underwater videos to document fish occurrence, behavior, and habitat use. These were random visual samples averaging 45 seconds per site. In most cases, we did not see the fish we were sampling from above the water. This approach was less disturbing to the fish and allowed us to sample a more wider range of habitats than snorkel surveys.



HDFS Telescoping pole set up

HDFS Telescoping pole in channel



Urban channelized section

Estuarine section

Natural stream section

Natural stream section

Shallow channelized section

4. Results

This new approach rapidly and cost-effectively transformed data-poor stream reaches into multi-attribute, high-resolution maps of instream habitat, stream bank, and water-quality conditions. Combining the habitat data with the fish survey data provided strong habitat suitability results to use for:

Instream Flow

We surveyed Iao Stream, Maui to determine habitat conditions prior to flow restoration. The effort included both habitat and fish surveys. We began at the ocean and continuously surveyed over 6 km of stream upstream past the Maniania Ditch diversion in 2 days. We were able to document the extent of lost habitat, where flow resumed, and native and introduced species throughout the stream. We will conduct the post flow restoration survey later this year.



Iao Stream channelized lower section

Iao-Maniania Ditch diversion intake

Flood Control

We surveyed Manoa, Palolo, and Makiki Streams on Oahu in response to a USACE Flood Control Project. We surveyed fish and habitat throughout the streams to estimate available habitat, habitat lost to the project, and potential mitigation possibilities for 8 native stream animals.

The work showed species ranges, numerous habitat problems and revealed 5 undocumented barriers to fish migration. This was the first application of the HDSS approach in Hawaii.



Impact Assessment

We surveyed Waiawa Stream on Oahu in response to the elevated rail transit project. With 2 people, we completed 1 km of stream fish and habitat surveys in less than 4 hours. The work greatly improved our understanding of the potential impacts of the rail system station on the stream and presented several ways of potential mitigation for the project's impacts. This project highlighted the speed and ease of the approach in dealing with impact assessments.



HART website

2. High Definition Stream Surveys

We used the new multi-attribute High Definition Stream Survey (HDSS) technique that integrates GPS, video, and other sensors to survey several miles of stream per day with data collected continuously every meter. All the data collected are geo-referenced and can be classified in the HDSS Video Coder software and mapped in GIS software.



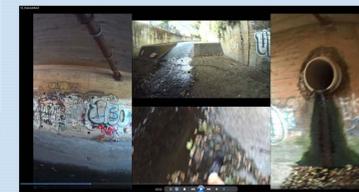
HDSS Backpack set up



Natural stream channels



Fully channelized segments



Infrastructure and outfalls

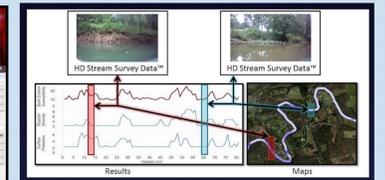


Instream barriers

- Habitat Type
- Depth
- Substrate
- Embeddedness
- Cover
- Channel Dimensions
- Wetted Width
- Bank Condition
- Infrastructure



HDSS Video Coder Software



Linked Maps, Graphics & Images

5. Conclusions

The new approach to habitat and fish survey sampling proved to be successful when compared to traditional survey methodologies:

- **Faster** = Habitat Surveys ≈ 30X faster & Fish Surveys ≈ 7X faster
- **Less Expensive** = 1/20th of the man hours on comparable projects
- **Easier** = Does not require highly experienced field staff; can use volunteer help
- **Better spatial coverage** = Complete surveys, not focused on small study areas
- **Greater site coverage** = Able to sample very shallow, swift or polluted sites
- **Lower impact** = No animals harmed and habitat disturbed single pass surveys
- **Reviewable** = Field video is archived and reviewable in the future
- **Broader use** = Addresses multiple issues with single survey, such as:
 - Instream flow, infrastructure, barriers, habitat suitability, species distributions, TMDL's, project assessment, mitigation, site monitoring, stream bank condition, riparian condition and pollution issues.
- **More Accessible** = Allows "virtual stream tours" for stakeholders to see actual issues without going out in the field.
- **Less Assumptions** = No need for REFERENCE SITES OR STATISTICAL EXTRAPOLATIONS when the whole stream was surveyed.

