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Setting Instream Flow Standards for Hawaiian Streams—the Role of Science

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Abstract

The State of Hawaii, Commission on Water Resource Management (Commission) is responsible for protecting and managing Hawaii's ground-water and surface water resources. In its surface water management role, the Commission regulates all stream channel alterations, surface water diversions, and amendments to the interim instream flow standards. This paper tracks the Commission's progress towards setting instream flow standards for Hawaiian streams and the role of science in the process.

Introduction

The State Water Code (Water Code), Chapter 174C, Hawaii Revised Statutes (HRS), was adopted by the legislature of the State of Hawaii in 1987. The Commission, established under the Water Code, is responsible for protecting and managing Hawaii's ground-water and surface water resources. In its surface water management role, the Commission regulates all stream channel alterations, surface water diversions, and amendments to the interim instream flow standards. Additionally, the Commission has established an instream use protection program designed to protect, enhance, and reestablish, where practicable, beneficial instream uses of water in the State. This paper briefly reviews the history of the Water Code and follows the Commission's progress towards setting instream flow standards for Hawaiian streams, and the role of science in the process.

Brief History of the Water Code and Instream Flow Standards

1978 Constitutional Convention

The 1978 Constitutional Convention and 7 November 1978 election added Article XI, Section 7, to the Constitution of the State of Hawaii:

> *Section 7. The State has an obligation to protect, control and regulate the use of Hawaii's water resources for the benefit of its people.*
>
> *The legislature shall provide for a water resources agency which, as provided by law, shall set overall water conservation, quality and use policies; define beneficial and reasonable uses; protect ground and surface water resources, watersheds and natural stream environments; establish criteria for water use priorities while assuring appurtenant rights and existing correlative and riparian uses and establish procedures for regulating all uses of Hawaii's water resources.*

Section 7 reflected the concern of the people of Hawai'i to protect, control, and regulate its water resources, and authorized the legislature to set up a water resources agency.

Hawai'i Instream Use Protection Act of 1982

In 1982, the legislature passed Chapter 176D, PROTECTION OF INSTREAM USES OF WATER, or the Hawai'i Instream Use Protection Act of 1982. The intent of the legislature in passing the Act was that the State (for this Act, the Board of Land and Natural Resources) "develop instream flow

standards and instream flow programs to protect and enhance, where practicable, beneficial instream uses of water". Although the Act only applied to windward O'ahu districts, and was programmed to expire upon the enactment of a state water code, it contained definitions (continuous flowing water, instream flow standard, instream use, stream channel, stream system) and provided guidelines toward the development of instream flow standards.

Windward O'ahu Interim Instream Flow Standard — 30 July 1987

On 30 July 1987, the Board of Land and Natural Resources adopted an interim instream flow standard for Windward O'ahu pursuant to Chapter 176D, HRS. The Department of Land and Natural Resources then began work on interim standards for Kaua'i and East Maui streams, by holding public information meetings on Kaua'i and Maui in October 1987. Also in 1987, Hawaii's Legislature adopted the Water Code that allowed for the establishment of new interim and permanent instream flow standards (Sec. 174C-71, HRS).

Section 8, Act 45, Session Laws of Hawai'i 1987 provided that Chapter 176D, HRS, be repealed two years from the effective date of the Water Code (i.e., on 1 July 1989). As such, the existing interim standard for windward O'ahu streams would cease to have the force and effect of law. Under the Water Code, the Commission would need to reconsider and readopt an interim instream flow standard for windward O'ahu before 1 July 1989, when Chapter 176D is repealed.

An interim instream flow standard, defined by Chapter 176D, HRS, is a temporary flow standard of general applicability that will identify a quantity of water to be set aside to protect instream uses, such as fish and wildlife habitats and recreational and aesthetic values, until permanent instream flow standards can be established on a stream-by-stream basis.

The interim standard, adopted on 30 July 1987 by the Board of Land and Natural Resources, reads as follows:

> *A. With respect to gaged streams, the standard be set at 100% of the median flow computed after existing diversions have been deducted.*
>
> *B. With respect to ungaged streams, no further diversion shall be allowed.*
>
> *C. These interim instream flow standards may be modified on a case-by-case, stream-by-stream basis by individual application, when additional and more specific data become available for each such individual stream.*

1987 State Water Code

With the adoption of the Water Code in 1987, the responsibility to develop instream flow standards passed from the Board of Land and Natural Resources to the newly formed Commission. Part VI of the Water Code, entitled Instream Uses of Water, outlines the Commission's responsibilities regarding statewide protection of instream uses, including the setting of instream flow standards.

PART VI. INSTREAM USES OF WATER

§174C-71 Protection of instream uses. *The commission shall establish and administer a statewide instream use protection program. In carrying out this part, the commission shall cooperate with the United States government or any of its agencies, other state agencies, and the county governments and any of their agencies. In the performance of its duties the commission shall:*

(1) Establish instream flow standards on a stream-by-stream basis whenever necessary to protect the public interest in waters of the State;

- *(A) The commission, on its own motion, may determine that the public interest in the waters of the State requires the establishment of an instream flow standard for streams;*
- *(B) In acting upon the establishment of instream flow standards, the commission shall set forth in writing its conclusion that the public interest does or does not require, as is appropriate, an instream flow standard to be set for the stream, the reasons therefore, and the findings supporting the reasons;*
- *(C) Each instream flow standard shall describe the flows necessary to protect the public inter-*

est in the particular stream. Flows shall be expressed in terms of variable flows of water necessary to protect adequately fishery, wildlife, recreational, aesthetic, scenic, or other beneficial instream uses in the stream in light of existing and potential water developments including the economic impact of restriction of such use;

(D) Establishment or modification of an instream flow standard shall be initiated by the commission by providing notice of its intention to set an instream flow standard in a newspaper of general circulation published in the vicinity of the stream in question, to the mayor of the appropriate county, and to persons who have previously requested such notice in writing;

(E) After giving notice of its intention to set an instream flow standard, the commission or other agencies in participation with the commission shall investigate the stream. During the process of this investigation, the commission shall consult with and consider the recommendations of the department of health, the aquatic biologist of the department of land and natural resources, the natural area reserves system commission, the University of Hawai'i cooperative fishery unit, the United States Fish and Wildlife Service, the mayor of the county in which the stream is located, and other agencies having interest in or information on the stream, and may consult with and consider the recommendations of persons having interest in or information on the stream. In formulating the proposed standard, the commission shall weigh the importance of the present or potential uses of water from the stream for noninstream purposes, including the economic impact of restriction of such uses. In order to avoid or minimize the impact on existing uses of preserving, enhancing, or restoring instream values, the commission shall consider physical solutions, including water exchanges, modifications of project operations, changes in points of diversion, changes in time and rate of diversion, uses of water from alternative sources, or any other solution;

(F) Before adoption of an instream flow standard or modification of an established instream flow standard, the commission shall give notice and hold a hearing on its proposed standard or modification;

(2) Establish interim instream flow standards;

(A) Any person with the proper standing may petition the commission to adopt an interim instream flow standard for streams in order to protect the public interest pending the establishment of a permanent instream flow standard;

(B) Any interim instream flow standard adopted under this section shall terminate upon the establishment of a permanent instream flow standard for the stream on which the interim standards were adopted;

(C) A petition to adopt an interim instream flow standard under this section shall set forth data and information concerning the need to protect and conserve beneficial instream uses of water and any other relevant and reasonable information required by the commission;

(D) In considering a petition to adopt an interim instream flow standard, the commission shall weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses;

(E) The commission shall grant or reject a petition to adopt an interim instream flow standard under this section within one hundred eighty days of the date the petition is filed. The one hundred eighty days may be extended a maximum of one hundred eighty days at the request of the petitioner and subject to the approval of the commission;

(F) Interim instream flow standards may be adopted on a stream-by-stream basis or may consist of a general instream flow standard applicable to all streams within a specified area;

(3) Protect stream channels from alteration whenever practicable to provide for fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses;

(A) The commission shall require persons to obtain a permit from the commission prior to

undertaking a stream channel alteration; provided that routine streambed and drainageway maintenance activities and maintenance of existing facilities are exempt from obtaining a permit;

(B) Projects which have commenced construction or projects reviewed and approved by the appropriate federal, state, or county agency prior to July 1, 1987, shall not be affected by this part;

(C) The commission shall establish guidelines for processing and considering applications for stream channel alterations consistent with section 174C-93;

(D) The commission shall require filing fees by users to accompany each application for stream channel alteration;

(4) Establish an instream flow program to protect, enhance, and reestablish, where practicable, beneficial instream uses of water. The commission shall conduct investigations and collect instream flow data including fishing, wildlife, aesthetic, recreational, water quality, and ecological information and basic streamflow characteristics necessary for determining instream flow requirements. The commission shall implement its instream flow standards when disposing of water from state watersheds, including that removed by wells or tunnels where they may affect stream flow, and when regulating use of lands and waters within the state conservation district, including water development. [L 1987, c 45, pt of §2; am L 1988, c 276, §2]

Definition of Instream Use

Instream use is defined as "beneficial uses of stream water for significant purposes which are located in the stream and which are achieved by leaving the water in the stream. Instream uses include, but are not limited to: (1) Maintenance of fish and wildlife habitats; (2) Outdoor recreational activities; (3) Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation; (4) Aesthetic values such as waterfalls and scenic waterways; (5) Navigation; (6) Instream hydropower generation; (7) Maintenance of water quality; (8) The conveyance of irrigation and domestic water supplies to downstream points of diversion; and (9) The protection of traditional and customary Hawaiian rights".

Definition of Instream Flow Standard

Instream flow standard is defined as "a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses".

Setting an Instream Flow Standard

The Water Code distinguishes between an instream flow standard and an interim instream flow standard. An Instream Flow Standard is to be established by the Commission, on its own motion, on a stream-by-stream basis. Each Instream Flow Standard needs to describe the flow necessary to protect the public interest in the particular stream. Flows are to be expressed in terms of variable flows of water necessary to adequately protect fishery, wildlife, recreational, aesthetic, scenic, or other beneficial instream uses in the stream. In investigating a stream to set an Instream Flow Standard, the Commission shall consult with and consider the recommendations of the department of health, the aquatic biologist of the department of land and natural resources, the natural area reserves system commission, the University of Hawai'i cooperative fishery unit, the United States Fish and Wildlife Service, and other agencies having interest or information on the stream. Finally, prior to setting an Instream Flow Standard, the Commission shall give notice and hold a hearing on its proposed standard or modification.

Setting an Interim Instream Flow Standard

Any person with proper standing may petition the Commission to establishing an Interim Instream Flow Standard. The Interim Instream Flow Standard may be adopted on a stream-by-stream basis or may consist of a general instream flow standard applicable to all streams within a specified area. A petition to adopt an Interim Instream Flow Standard requires information and data, but there is no

requirement to consult with and consider recommendations from any agency. Finally, any Interim Instream Flow Standard adopted shall terminate upon the establishment of a permanent Instream Flow Standard.

East Maui, Kaua‘i, Hawai‘i and Moloka‘i Interim Instream Flow Standards – 15 June 1988
The Interim Instream Flow Standards for all streams on East Maui, Kaua‘i, Hawai‘i, and Moloka‘i were adopted by the Commission on 15 June 1988. Following is the Interim Instream Flow Standard for East Maui streams from the Hawaii Administrative Rules (HAR) §13-169-44 Interim instream flow standard for East Maui. The standards for Kaua‘i, Hawai‘i, and Moloka‘i are identical except for the area names and section numbers in the rules.

> *§13-169-44 Interim instream flow standard for East Maui. The Interim Instream Flow Standard for all streams on East Maui, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new of expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified by the following conditions:*
> *(1) Based upon additional information or a compelling public need, a person may petition the commission on water resource management to amend the standard to allow future diversion, restoration, or other utilization of any streamflow.*
> *(2) The commission reserves its authority to modify the standard or establish new standards, including area-wide or stream-by-stream standards, based upon supplemental or additional information.*
> *(3) In any proceeding to enforce the instream flow standard, the commission, its delegated hearing officer, or a judicial officer may abate the enforcement proceeding if, under the circumstances and weighing the importance of the present or potential instream values with the importance of the present or potential uses of the stream's water for non-instream purposes (including the economic impact of restricting such uses), the enforcement of the instream flow standard would:*
> *(A) Create a substantial hardship on a use existing on the effective date of this standard; or*
> *(B) Impermissibly burden a right, title, or interest arising under law.*
> *(4) Projects under construction or projects that have secured all discretionary permits required by appropriate federal, state, or county agencies prior to July 1, 1987 shall not be affected by the standard.*
> *[Eff. Oct. 8, 1988] (Auth: HRS Sec. 174C-8) (Imp: HRS Sec. 174C-2, 174C-3, 174C-5, 174C-71)*

Act 276, Session Laws of Hawaii – 13 June 1988
The 1988 Legislature amended the Water Code by adding Section 174C-31, subsection (c) (4), requiring the Commission to: “Identify rivers or streams, or a portion of a river or stream, which appropriately may be placed within a wild and scenic rivers system, to be preserved and protected as part of the public trust. For the purposes of this paragraph, the term “wild and scenic rivers” means rivers or streams, or a portion of a river or stream of high natural quality or that possess significant scenic value, including but not limited to, rivers or streams which are within the natural area reserves system. The commission shall report its findings to the legislature twenty days prior to the convening of each regular legislative session.” The 1988 Legislature also amended Section 174C-71(1)(E), by adding “the aquatic biologist of the department of land and natural resources, the natural area reserves system commission, the University of Hawai‘i cooperative fishery unit” to the list of agencies consulted when setting an instream flow standard.

West Maui and Leeward O‘ahu Interim Instream Flow Standards – 19 October 1988
The Interim Instream Flow Standards for West Maui and Leeward O‘ahu streams were adopted by the Commission on 19 October 1988. The standards for West Maui and Leeward O‘ahu are identical to the standards for East Maui, Kaua‘i, Hawai‘i, and Moloka‘i except for the area names and section numbers in the rules.

Windward O‘ahu Interim Instream Flow Standard – 19 April 1989
The Interim Instream Flow Standard for Windward O‘ahu streams was adopted by the Commission on April 19, 1989. The standard adopted by the Commission replaced the original standard adopted by the Board of Land and Natural Resources on July 30, 1987. The new standard incorporated the language used for the other areas of the state.

Hawaii Stream Assessment – October 1988 to December 1990
The Commission initiated the Hawaii Stream Assessment through a cooperative agreement with the National Park Service’s State and Local Rivers and Trails Conservation Assistance Program. This program was established in response to the National Wild and Scenic Rivers Act, that encouraged the National Park Service to assist states to consider needs and opportunities for establishing state and local wild and scenic, and recreational river areas [Public Law 90-542, Section 11(a)]. The primary task of the Hawaii Stream Assessment was to identify streams appropriate for protection. It made no attempt to assess then-existing or potential offstream use. It was presented from the conservation point of view. The Hawaii Stream Assessment was to be used as a reference document that included a physical inventory of Hawaii’s 376 perennial streams and working maps, as assessment of resources associated with those streams, and a database. The Hawaii Stream Assessment was to help policy-makers, resource managers, developers, scientists and the interested public to locate published information for a particular stream, identify and prioritize areas where information is needed, understand stream resources within a statewide context, make management decisions based on data, develop general stream resource protection guidelines, and identify specific streams appropriate for protection and enhancement.

Senate Concurrent Resolution No. 130—April–May 1992
Senate Concurrent Resolution No. 130, Requesting Adoption of an Environmental Protection System for Hawaii’s Streams, was passed by the Senate in April 1992 and by the House of Representatives in May 1992. The Resolution requested that the Commission “finalize, adopt, and put into place the stream protection system, including designation of streams to be protected pursuant to state or federal law”.

The Stream Protection and Management Task Force—May 1993 to April 1994
The Stream Protection and Management (SPAM) Task Force was formed in part due to the request by the Legislature in Resolution No. 130, and in part due to the earlier Act 276 described above. The Commission, in November 1992, held a briefing to address Act 276 and resolution 130. The Commission reflected on the strengths and weaknesses of the past and existing surface water program and directed staff to develop a surface water management strategy that included a stream categorization system and a mechanism to include community-based planning. The Task Force was a multi-interest group, professionally facilitated, and chaired by a water commissioner. The Task Force gathered information to more clearly understand the various issues related to surface water, attended public meetings to gather more information, and began facilitated deliberations. The Task Force Report of April 1994, entitled Stream Protection and Management in Hawai‘i: Recommendations and Suggestions, listed consensus agreements reached by the members and constituted their recommendations to the Commission. The Report also included a list of suggestions provided by the members, representing the opinions of the individual members, not the Task Force as a whole. The Commission, on May 18, 1994, accepted the Report and directed staff to hold public forums to discuss the Report in conjunction with the draft staff recommendations.

Stream Protection and Management in Hawai‘i, Draft Staff Recommendations—May 1994
Draft staff recommendations, based on the work of the SPAM Task Force, were presented to the Commission on 18 May 1994. The Commission directed staff to hold public forums to discuss the Task Force Report in conjunction with the draft staff recommendations, and to submit final recommendations to the Commission along with draft rules and an implementation plan “as soon as possible”.

Commission Staff Reorganization—July 2002

In July 2002, the Commission staff was reorganized. The Stream Protection and Management Branch was formed with two sections, the Surface Water Regulation Section and the Instream Use Protection Section. The Surface Water Regulation Section continued to regulate surface water through Stream Channel Alteration Permits, Stream Diversion Works Permits, and amendments to the Interim Instream Flow Standards. The Instream Use Protection Section was added to more adequately address the setting of Instream Flow Standards and improve the overall stream management objectives. Key objectives include: 1) data compilation, including developing and promoting a standardized watershed coding system and a surface water information management system; 2) developing a surface water monitoring program; 3) developing a stream protection program – categorizing streams; 4) setting an instream flow standard methodology; and 5) increasing public outreach and education.

Pristine Stream Policy Recommendations and Proposed Actions – February 2004

The Commission staff, at a Commission meeting in February 2004, proposed that the Commission adopt a pristine stream policy to protect streams of high natural quality, to identify streams for which the Commission would require a higher level of scrutiny before allowing any modifications or diversions, to continue the on-going process of developing a methodology of setting instream flow standards, and to inform and educate the public of this policy. Comments from interested persons during the meeting included statements that the Commission should direct its attention to establishing instream flow standards, that the Commission should seek more public input, and that input should be sought at the beginning of the process instead of at the end. Based on the testimony, the proposal was deferred and staff was directed to work with the community and other stakeholders by holding public meetings to discuss the matter. The Stream Policy Working Group, composed of many of the interested persons who attended the February 2004 Commission meeting, as well as other interested persons, began meeting a week after the Commission meeting, and met a total of five times, ending in July 2004. By the final meeting in July, it was the consensus of the group that the Commission staff should work on a methodology to set interim instream flow standards, rather than pursue a pristine stream policy. The Stream Policy Working Group will be recalled on an as-needed basis to provide input as staff develops the methodology.

Discussion

The Role of Science in the Commission's History

Now that we have briefly reviewed the history of the Commission with regard to setting instream flow standards, let us go back and see the role science has taken in the process.

1978 Constitutional Convention

The addition of Article XI, Section 7, to the Constitution provided for "a water resources agency", but there was no science involved.

Hawai'i Instream Use Protection Act of 1982

Though this Act was specifically addressed to Windward O'ahu streams, it was the first step towards setting instream flow standards. Of particular interest, from the "role of science" perspective, were references to "describe the flows necessary to protect the public interest in the particular stream," and to express flows "in terms of variable flows of water necessary to protect adequately fishery, wildlife, recreational, aesthetic, scenic, or other beneficial instream uses". The Act also provided for consultation with and consideration of recommendations of the Department of Health, the United States Fish and Wildlife Service, and other agencies having interest in or information on the stream.

Windward O'ahu Interim Instream Flow Standard of July 30, 1987

This pre-Water Code standard was adopted by the Board of Land and Natural Resources for

Windward O‘ahu streams under the provisions of the previously mentioned Hawai‘i Instream Use Protection Act. For gaged streams, the standard was set at “100% of the median flow computed after existing diversions have been deducted”. For ungaged streams, no further diversions were allowed. There was a provision for modification of the standard on a case-by-case basis, when additional and more specific data become available. Science was used, via the gaging of streams, in setting the standard for the gaged streams, and in the provision for modifying the standard based on additional data.

1987 State Water Code

From the “role of science” perspective, the Water Code added new definitions (hydrologic unit, impoundment, interim instream flow standard, noninstream use, stream, stream diversion, stream reach, watercourse, etc.) and expanded some of the earlier definitions (channel alteration, stream system, etc.).

It authorized the Commission to: carry out topographic surveys, research, and investigations into all aspects of water use and water quality; maintain an advisory staff of experts; plan and coordinate programs for the development, conservation, protection, control, and regulation of water resources based on the best available information; catalog and maintain an inventory of all water uses and water resources; and determine appurtenant water rights, including quantification of the amount of water entitled to by that right.

Legislative intent regarding Interim Instream Flow Standard

Conference Committee Report No. 119, RE: H.B. No. 35, H.D. 1, S.D. 2, C.D.1, dated 27 April 1987, gives us some insight into the legislature’s thinking (perhaps we could call this non-scientific or “wishful” thinking) regarding the ease (time-wise and science-wise) in the setting of Instream Flow Standard and Interim Instream Flow Standard. The Report, that recommended the final passage of the Water Code, included the following:

> *The Commission is directed to implement instream flow standards when disposing of water from state watersheds and when regulating use of lands and waters within conservation districts.*
>
> *To the fullest extent possible, it is the intent of the Legislature that interim instream flow standards be established prior to either new or expanded diversions of water from a stream. Protection of our streams is an important part of the water code.*

It is your Committee’s recommendation that the interim instream flow standards be undertaken by a joint Department of Land and Natural Resources and appropriate federal agencies such as the U.S. Fish and Wildlife Service and U.S. Geological Survey, in order to take advantage of in-house, least-cost expertise.

Section (13) indicates that at least the conference committee, if not the entire Legislature, believed setting interim standards would be a relatively simple (science-wise) and quick (time-wise) task, and that it could be done with “in-house, least-cost expertise”. The legislature gave the Commission the following deadlines to set interim instream flow standards: 1) Windward O‘ahu by July 31, 1987; 2) East Maui and Kaua‘i by December 31, 1987; 3) Hawai‘i and Moloka‘i by July 1, 1988; and 4) West Maui and Leeward O‘ahu by December 31, 1988. However, it can also be concluded that the legislature regarded the protection of streams as an important part of the Water Code, and that the Water Code contemplated using the expertise of various state and federal agencies to assist in setting interim and permanent instream flow standards.

Setting Interim Instream Flow Standards for Various Areas of the State—15 June 1988 to 19 April 1989

The newly formed Commission, working with the deadlines set by the legislature to set interim instream flow standards, reached consensus in defining the interim instream flow standard for all streams statewide to be “that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without fur-

ther amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified by the following…". The interim standard was not based on science, but on the requirements of the Water Code, deadlines set by the legislature, comments received at six public meetings held across the state, and several redrafts of the language at the Commission meeting on June 15, 1988.

Act 276, Session Laws of Hawai'i—13 June 1988

Act 276 contributed to the role of science in setting instream flow standards by adding to the Water Code "the aquatic biologist of the department of land and natural resources, the natural area reserves system commission, the University of Hawai'i cooperative fishery unit" to the list of agencies to be consulted when setting an instream flow standard.

Hawai'i Stream Assessment – December 1990

The Hawai'i Stream Assessment was undertaken as an effort to develop a broad-based collection of existing information on Hawaii's rivers and streams to help make water protection and management decisions. The inventory and assessment was of a general nature and was not intended to take the place of subsequent reviews and studies. However, it continues to serve as a baseline source of information for anyone interested in Hawaii's streams.

A list of 376 perennial streams on the five major islands (Hawai'i, Maui, O'ahu, Kaua'i, and Moloka'i) was compiled and assessed in four resource categories: 1) aquatic resources, 2) riparian resources, 3) cultural resources, and 4) recreational resources. Additional areas of concern were addressed, including gaging, water quality, water supply, dams and reservoirs, hydroelectric power, and channelization. A qualitative ranking system was applied, whereby streams were ranked as outstanding, substantial, moderate, or limited.

The Division of Aquatic Resources has expanded the aquatic resources portion originally contained in the Hawai'i Stream Assessment and has developed and maintained a large database, known as the Stream Biological Database, of freshwater stream and estuary biological resources throughout the State.

The Stream Protection and Management Task Force – May 1993 to April 1994

The Stream Protection and Management Task Force members (there were eight members including the chair) represented three generalized interests: stream biology, stream economy, and the cultural aspects of stream life and stream use. "Stream biology" was represented by: 1) the State Department of Land and Natural Resources, Division of Aquatic Resources; 2) the U.S. Fish and Wildlife Service; and 3) the Sierra Club Legal Defense Fund. Consensus recommendations related to science included: 1) verification of perennial streams by the Commission, Division of Aquatic Resources or the U.S. Fish and Wildlife Service; 2) recommendation that the Commission convene various working conferences, one of which was to insure implementation of water quality standards (including biological standards); 3) providing adequate funding for biological studies; and 4) endorsing the idea of holding an annual science conference and an annual stream conference for the public.

Specific Examples of the Role of Science in Setting Instream Flow Standards

Kuhiwa Well Contested Case Hearing—May–June 1991

The Kuhiwa Well Contested Case Hearing was the first contested case hearing before the Commission. Maui Pineapple Company, Ltd. (Maui Pine) applied for a pump installation permit to use water from the Kuhiwa Well to augment their water supply during dry periods. The central issue raised by the Hana Community Association was the possible effect of well pumpage on the flow of streams and springs in the area. Two opposing models of ground-water behavior were presented to the Commission by expert hydrologic witnesses. The data and analyses at that time were insufficient to determine which of the models better described the conditions in the region. Both models suggested that pumping the well would have some impact on the streams and springs in the area, but neither model could conclude whether the impact would be large enough to be detectable. The

Commission concluded that the only method available to fully predict in advance actual streamflow depletion from pumping the Kuhiwa Well was through construction of a ground-water model. It also concluded that since there was insufficient data available, the time and cost to obtain the data would be prohibitive. Three approaches to monitoring for impacts of pumping on stream flows were proposed to the Commission: a single-gage or observation point flow measurement approach; a paired-gage flow measurement approach; and a biological monitoring approach. In its final decision and order, the Commission allowed Maui Pine to install the well and use the water with the condition that a biological and hydrological monitoring system be established to provide information that would guide future Commission decisions and actions. If monitoring determined that there was detectable and not "insubstantial" reduction of instream flows, Maui Pine would be required to stop pumping and to obtain an amendment to the interim instream flow standard. Science, in this case, was not used to determine an instream flow standard. It was used to determine that amending the interim instream flow would not be required unless there was detectable and not "insubstantial" reduction of stream flows.

Waiāhole Contested Case Hearing–25 January 1995 to the Present

The Waiāhole Ditch Contested Case Hearing involves three different types of applications to use water from the Waiāhole Ditch system on Oʻahu: 1) water use permit applications resulting from the designation of the windward Oʻahu aquifer systems as ground-water management areas in May 1992; 2) applications to restore water to windward Oʻahu streams by amending the interim instream flow standard for windward Oʻahu; 3) petitions for reservations of windward Oʻahu ground water. Protection of traditional and customary Hawaiian rights and principles of the Public Trust Doctrine are also implicated.

The interim instream flow standard for windward Oʻahu streams is linked with the water use permit applications because the base flows of windward Oʻahu streams and the development tunnels of the Waiāhole Ditch system develop water from the same high level aquifers in dike intruded lavas.

The Commission, on 25 January 1995, ordered that the contested case hearing be held. The formal portion of the hearing began on 9 November 1995 and continued to 21 August 1996, during which time there were fifty-two days of hearings, testimony from 161 witnesses, and 567 exhibits introduced into evidence. Closing arguments took three days, from 18–20 September 1996. The Commission issued its Findings of Fact, Conclusions of Law, and Decision and Order on 24 December 1997 (D&O I). The D&O I was appealed to the Hawaii Supreme Court. The Supreme Court issued its decision on 22 August 2000 (Waiāhole I), and remanded certain matters back to the Commission. The Commission held further hearings and issued its second Waiāhole Decision on 28 December 2001 (D&O II). The D&O II was also appealed to the Supreme Court. The Supreme Court issued its second decision on 21 June 2004 (Waiāhole II). The Commission is scheduled to hold hearings on the matter in early April 2005.

Many of the 161 witnesses that provided testimony during the hearing were scientists. Both scientists and nonscientists among the many participants in the proceedings were treated to (or some would say, "forced to endure") an abundance of information about general stream ecology; native Hawaiian gobies; alien, introduced, exotic fish species; parasites; native Hawaiian damselflies; Hawaiian and exotic plants; stream restoration in general; instream flow protection and techniques used elsewhere; and estuarine and marine ecology. Although there were many studies generated by the Waiāhole case, one of the biggest problems, from the stream restoration perspective, was the lack of baseline data. No one had done any studies on the abundance of native species in Waiāhole and other windward Oʻahu streams prior to the construction of the Waiāhole ditch in 1916. No one had done any studies prior to the partial restoration of flow to Waiāhole Stream in December 1994. As a consequence of the lack of baseline data, the partial restoration of flow to Waiāhole Stream could only be characterized as having a positive effect on the native fish species in the stream, and that additional flows would be expected to increase the native biota habitat. It also became apparent that there was much more to be done to increase our knowledge regarding native fish species. There was testimony that "aquatic experts have insufficient knowledge of the ecosystem context for native

Hawaiian fish species to define the quantitative population improvements resulting from stream flow restoration;" "no data is currently available to tell what flow characteristics are necessary to promote movement of larval fishes from the ocean into freshwater streams and what current velocities are necessary to limit or prevent the occurrence of exotic fishes in such streams;" and "no one in the scientific community can conclusively state the amount of water that is necessary to positively impact *'o'opu* recruitment".

Waiāhole Contested Case Hearing—Requirement to Fund Studies

The Commission, in its D&O I, required the permittees using water from the Waiāhole Ditch to help fund studies and monitoring activities resulting from the order. This was a precedent-setting step patterned in part after the Mono Lake Decision, September 1994. Funding was to be based on the amount of water used and on a pro rata basis. The Commission was to establish a committee to recommend a reasonable amount for the funding, and coordinate and set up the mechanism for the collection, accounting, and distribution of the funds.

The requirement was appealed to the Supreme Court by the permittees who maintained that the Water Code requires the Commission to fund any studies. The Supreme Court concluded, in its 22 August 2000 Waiāhole I decision, that "the Commission has the general authority to condition the permits upon compliance with the instant funding requirement, which more properly falls under the category of a regulatory fee, rather than a land development exaction. Under the standard applicable to such fees, we hold that, as a general matter, the funding requirement does not constitute an illegal tax". The Commission, in May 2002, based upon recommendations by a Commission-appointed funding committee, determined that $0.025 per 1,000 gallons of water used, is a reasonable rate for the permittees.

Petitions to Amend the Interim Instream Flow Standard (IIFS) for 27 East Maui streams—May 2001 to the Present

In May 2001, the Commission received petitions to amend the interim instream flow standards for 27 East Maui streams. In March 2002, the Commission approved a cooperative agreement between the U.S. Geological Survey and the Commission for a study entitled Water Resource Investigations for Northeast Maui Streams. The study period for the $600,000 study runs for the period 1 October 2002 to 30 September 2005, coinciding with the Federal fiscal year. The U.S. Geological Survey will contribute 50%, or $300,000 to the program. The Commission's share of the matching program will be 12.5 %, or $75,000 ($25,000 per year), as it will be for the Land Division of the Department of Land and Natural Resources, the Maui Department of Water Supply, and Alexander & Baldwin Inc., respectively, for a total of $300,000 to match the U.S. Geological Survey's contribution.

Related to the U.S. Geological Survey's studies in East Maui, and in an effort to increase communication and foster greater collaboration among Hawaii's stream scientists, a working group composed primarily of aquatic biologists, and initially facilitated by staff of the Division of Aquatic Resources, was convened to provide a forum for the open exchange of ideas and suggestions related to instream flow standards and Hawaiian stream biology based upon scientifically defensible arguments, and to provide decision support to the Commission. The working group meets on an as-needed basis and is composed of Commission staff and scientists representing the U.S. Geological Survey, the University of Hawai'i Zoology Department, the Bishop Museum, the University of Nebraska Lincoln, and the Hawaii Division of Aquatic Resources.

Base Flows Representative of Natural Conditions for Streams Affected by the Waiāhole Ditch–U.S. Geological Survey, April 2004 to January 2006

The Commission has entered into an agreement with the U.S. Geological Survey to study streams affected by the Waiāhole Ditch system. The $120,000 project ($60,000 each by the U.S. Geological Survey and the Commission) involves data analysis, report writing, and publication of a U.S. Geological Survey Science Investigations Report that provides estimates of base flows representative of natural conditions for streams in windward O'ahu currently affected by the Waiāhole Ditch

and Tunnel System. The project is part of the Commission's efforts to establish instream flow standards for the Waiāhole Ditch contested case hearing. The State's portion of the agreement is a combination of funding from the Division of Aquatic Resources and from the Waiāhole water users fund established through the contested case hearing.

Proposed GIS-Based Hydrologic Modeling Project

The Commission and the Division of Aquatic Resources are working on a project with Dr. James Parham at the University of Nebraska, as part of establishing a methodology of setting instream flow standards. This project seeks to calibrate a distributed rainfall-runoff model (like TOPMODEL) on a group of watersheds and streams with long-term discharge records. The calibrated model will then be tested against another group of streams with long-term discharge records to determine the applicability of using the model on streams with short or non-existent discharge records to predict pre-diversion flow conditions. This effort seeks to quantify the accuracy of the model to predict an unknown hydrograph and to determine the most sensitive variables (topography, land cover, soils, etc.) to developing the rainfall-runoff relationship. Ultimately, if successful, the rainfall-runoff model would be used together with GIS-based models of native fish habitat and instream distributions to allow pre-diversion conditions to be compared with current conditions.

Conclusion

The Commission must establish instream flow standards for Hawaii's streams. With the help of science, we must investigate the ecology of Hawaiian streams and determine the correlation between flow levels and instream values as the first steps in the methodology for determining instream flow standards. It takes lots of time and money to do such work. The following is our dilemma. The Commission could continue allowing water to be taken from streams until adequate scientific information becomes available. Conceivably, a stream could be incrementally drained without having enough information to determine its instream flow needs. On the other hand, some suggest that no water be taken from any streams until sufficient scientific information on instream requirements become available. The Supreme Court, in its 22 August 2000 Waiāhole I decision, recognized the Commission's dilemma and commented:

> *This dilemma offers no simple solution. At the present time, we hold only that the Commission's inability to designate more definitive instream flow standards neither allows the prolonged deferral of the question of instream use protection nor necessarily precludes present and future allocations for offstream purposes. Accordingly, the Commission must apply, in its own words, "a methodology that recognizes the preliminary and incomplete nature of existing evidence," and, indeed, incorporates elements of uncertainty and risk as part of its analysis. Such a methodology, by its nature, must rely as much on policy considerations as on hard scientific "facts".*
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> *In furtherance of its trust obligations, the Commission may make reasonable precautionary presumptions or allowances in the public interest. The Commission may still act when public benefits and risks are not capable of exact quantification. At all times, however, the Commission should not hide behind scientific uncertainty, but should confront it as systematically and judiciously as possible — considering every offstream use in view of the cumulative potential harm to instream uses and values and the need for meaningful studies of stream flow requirements. We do not expect this to be an easy task. Yet it is nothing novel to the administrative function or the legal process in general. And it is no more and no less than what the people of this state created the Commission to do".*

We appreciate the scientific community and all the work on Hawaiian streams that has been done in the past and continues to be done today. We look forward to working with all of you as we continue the Commission's work towards setting instream flow standards for our streams. The Commission and staff, I believe even more than the Supreme Court, recognize that it is not an easy task. But that is what we have been asked to do by the people of Hawai'i, and by the Supreme Court, and we ask for, and need, your help to accomplish it.