CHAPTER 1:

1 INTRODUCTION

1.1. PURPOSE

The Federal Highway Administration (FHWA), Central Federal Lands Highway Division (CFLHD) in Partnership with the Hawaii Department of Transportation (HDOT) is proposing updates to improve stormwater management and the implementation of Best Management Practices (BMPs) on their transportation projects in the state of Hawaii.

The purpose of this manual is to provide guidance on common BMPs used in protecting water quality during planning, design and construction activities, with a heavy emphasis on work that is occurring adjacent to, over, or in the boundaries of waters meeting the definition of Waters of the United States (US) (WUS) under the Clean Water Act (30 Code of Federal Regulations [CFR] 328). A key component to successfully accomplish of this goal is an integrated storm water management approach to protecting water quality throughout the life of a project; from project planning and design to after construction completion.

In Hawaii, water is the life blood of the islands and the strong interconnection between precipitation, surface water and ground water is extremely pronounced. Integrated stormwater management is simply thinking about all of the factors that somehow affect this precipitation as it moves from the land surface to an eventual receiving water. It is the process of accounting for all of these factors (e.g. rate, volume, quality, ground water impact) in a logical process so that inadvertent mistakes are not made that could eventually harm a resource. The treatment train approach to stormwater and non-stormwater management mimics this natural sequence as the project design and construction team looks at potential pollutant sources and determines how best to address them, starting with the most basic of solutions and increasing in complexity only if needed, since simple methods of management are often the most practical.

Numerous planning, design, and construction techniques known as BMPs exist to protect natural receiving waters against pollutants commonly associated with the operation, maintenance and construction of transportation facilities. Early consideration of storm water management and BMP alternatives during project design is critical to successful water quality management during construction. The correct selection, installation, and maintenance of BMPs are also paramount in ensuring they effectively treat the pollutants of concern (POC) identified for a particular project.

The purpose of this practitioner guide is to provide regulators, developers, contractors, site managers and inspectors with a guide to an integrated stormwater management approach to project design and construction. Chapter 2 of this guide provides a summary of key components of an integrated stormwater management approach. Chapter 3 provides a BMP Selection Tool through the utilization of preferred BMPs for managing pollutants on transportation construction projects. Improvements in construction techniques and BMP technologies are constantly evolving. Most of the preferred BMPs discussed in this manual have been used effectively by departments of transportation across the country. The BMP Selection Tool provides a transparent and technically based BMP selection process that documents the decisions and streamlines overall the stormwater management process in an effort to improve permitting with the regulatory agencies.

Chapter 4 summarizes the standard construction stormwater and non-stormwater controls BMPs that are commonly implemented on transportation construction projects. This manual builds off of the wealth of available information on the subject of BMPs and proper implementation during construction. The BMPs contained in the Selection Tool do not constitute an exhaustive list of BMPs, but instead provide a summary of common practices utilized for managing pollutants on transportation projects. This manual does not supersede any existing BMP manual for Hawaii instead this manual has incorporated the BMPs included in existing manuals into the stormwater design process. Specifically, all BMPs included in Appendix A (*State of Hawaii (HDOT 2008), Department of Transportation; 2008 Construction Best Management Practices Field Manual*) and Appendix B (*State of Hawaii (HDOT 2015a), Department of Transportation; Storm Water Management Program, 2015 Storm Water Permanent Best Management Practices Manual*) are incorporated into this manual. These appended manuals provide further design details for the individual temporary and permanent BMPs that are commonly incorporated into transportation projects in Hawaii.

Finally, Chapter 5 provides a summary of additional BMPs not included in the before mentioned manuals, but which are commonly utilized for isolating construction from flowing or standing water.

Each additional BMP measure provided in this manual consists of the following:

- General description;
- Applications;
- Standards and Specifications;
- Limitations; and
- Inspections and Maintenance.

The BMPs included in this manual focus on the areas of site management, erosion control, and sediment control during construction including clean water diversion or isolation of a work area from water. They are established practices and procedures to control potential pollutants at their source. These BMPs supplement the standard erosion and sediment control measures included in project plans. Proper installation maintenance and inspection of these BMPs will further help protect Hawaii’s valuable water resources from harmful pollutants.

1.1 ACKNOWLEDGEMENTS

Appreciation and acknowledgment is extended to the California Department of Transportation (Caltrans), Idaho Department of Transportation (IDOT), Oregon Department of Transportation (ODOT), The Sacramento Region Stormwater Quality Design Steering Committee and the Lake Tahoe Regional Planning Agency for use of their publications in preparing the information contained in this manual.

This manual was made possible by the combined efforts of many professionals:

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1.2 DISCLAIMER

The information presented in this Practitioners Guide was taken from available and relevant sources deemed to be representative of appropriate BMPs (including clear water diversion and isolation techniques). This manual has been prepared as a reference guideline, however, due to site specific conditions, the selection of the BMPs must be used in conjunction with best professional judgment and sound engineering principles to assure proper function and performance of the BMPs contained herein. The author does not guarantee the accuracy or completeness of this document and will not assume any liability or responsibility for the use of, or for any damages resulting from the use of any information contained herein. The detail and the wording in this manual will not necessarily result in compliance with the appropriate Standard Specifications. Compliance with other requirements such as the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP-14), 2005 Hawaii Standard Specifications for Road and Bridge Construction and subsequent changes, Hawaii Administrative Rules (HAR), Chapter 11-54 (Water Quality Standards), and/or HAR, Chapter 11-55 (Water Pollution Control) are deemed the responsibility of the engineer / planner.

The FHWA and HDOT, their employees, contractors, and subcontractors make no warrant, expressed or implied, and assume no legal liability for the information in this manual; nor does any party represent that the uses of this information will not infringe upon privately owned rights. This manual has been prepared by the FHWA and HDOT and endorsed by the Department of Health-Clean Water Branch as voluntary guidance and best management practices (BMPs). The recommendations and protocols discussed in this manual are intended to be suggestions for FHWA and HDOT to use at their discretion. The guidance and BMPs are strictly voluntary and are not intended to implement, replace, duplicate, interpret, amend, or supplement any current statute or regulation. Adherence to the guidance and BMPs does not ensure compliance with any local, state, or federal statute or regulation nor does failure to follow the guidance and BMPs necessarily imply a violation of the National Environmental Policy Act, Hawaii Environmental Policy Act, Clean Water Act, Federal Endangered Species Act or other relevant statutes or legal requirements.

This guide is not intended to be a manual for designing plans and specifications, but a source of information about erosion, sediment, stormwater and non-stormwater control best management practices. The contents should not be interpreted as necessarily representing the policies or recommendations of other referenced agencies or organizations. Refer to state, federal and local regulations and permits for applicable design criteria. For additional detailed design guidance, please refer to the numerous references and manuals listed in the References section of this document. For further reference, see Federal, state and local stormwater and water quality regulations and requirements.

1.3 Scope of this Guide

Water quality can be affected when runoff carries sediment or other pollutants into streams, wetlands, lakes, marine waters and/or into groundwater. Stormwater management can help to reduce these effects. Stormwater management involves careful application of site design principles, construction techniques and source controls to prevent sediment and other pollutants from entering surface or groundwater, treatment of runoff to reduce pollutants, and flow controls to reduce the impact of altered hydrology. This is especially true during the planning, construction and maintenance of clear water diversion and isolation techniques implemented for infrastructure projects.

Numerous Department of Transportations and Stormwater Associations have evaluated and prepared BMP manuals to evaluate their effectiveness. Non-stormwater BMPs including clear water diversion and isolation techniques for construction projects that require work within or around wet areas are especially important given the nature of the work. An understanding of techniques is required to understand the anticipated in-water impacts from construction related erosion and sediment. Construction activities in or near open water can be managed to mitigate risks to water quality through the implementation of these or similar techniques. Technology is always changing, and additional materials, techniques, and products may be developed which expand upon the BMPs referenced within this manual.

1.4 Regulatory Setting

Legal protection of Hawai'i's water resources are guided by federal statutes and state statues and rules. The three primarily federal laws include: the Clean Water Act , the Coastal Zone Management Act, Coastal Zone Act Reauthorization Amendments , and the Safe Drinking Water Act.

1.4.1 Federal Requirements:

1.4.1.1 Clean Water Act

In 1972, Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the WUS from any point (A point source is any discrete conveyance such as a pipe or a man-made ditch.) unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. This act and its amendments are known today as the Clean Water Act (CWA). Congress has amended the act several times. In the 1987 amendments, Congress directed dischargers of storm water from municipal and industrial/construction point sources to comply with the NPDES permit scheme. The following are important CWA sections:

- Sections 303 and 304 require states to issue water quality standards, criteria, and guidelines.
- Section 401 requires an applicant for a federal license or permit to conduct any activity that may result in a discharge to waters of the U.S. to obtain certification from the state that the discharge will comply with other provisions of the act.

This is most frequently required in tandem with a Section 404 permit request (see below).

- Section 402 establishes the NPDES, a permitting system for the discharges (except for dredge or fill material) of any pollutant into waters of the U.S. The Department of Health, Clean Water Branch (DOH-CWB) administers this permitting program in Hawaii. Section 402(p) requires permits for discharges of storm water from industrial/construction and municipal separate storm sewer systems (MS4s).
- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the United States. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

The goal of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

1.4.1.1.1 Waters of the United States

The USACE derives its regulatory authority over potential WUS from two federal laws: 1) Section 10 of the Rivers and Harbors Act of 1899 and 2) Section 404 of the Clean Water Act (CWA) of 1972.

Section 10 of the Rivers and Harbors Act of 1899 prevents unauthorized obstruction or alteration of navigable WUS. Navigable waters are defined as *"subject to the ebb and flow of the tide and/or presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce"* (33 CFR 322.2(a)). A Section 10 permit is required for non-fill discharging activities that would place any structure below, within, or over navigable WUS, or would involve excavation/dredging or deposition of material or any obstruction or alteration in navigable WUS.

The CWA defines WUS subject to agency jurisdiction in 40 CFR 230.3. Under Section 404 of the CWA, dredged and fill material may not be discharged into jurisdictional WUS (including wetlands) without a permit. Wetlands are a subset of jurisdictional WUS and are jointly defined by the USACE and the U.S. Environmental Protection Agency (40 Code of Federal Regulations [CFR] 230.3) as *"those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."*

The USACE issues two types of 404 permits: General and Standard permits. There are two types of General permits: Regional permits and Nationwide permits. Regional permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to allow a variety of minor project activities with no more than minimal effects.

Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of the USACE's Standard permits. There are two types of Standard permits: Individual permits and Letters of Permission. For Standard permits, the USACE decision to approve is based on compliance with U.S. Environmental Protection Agency's (EPA) Section 404 (b)(1) Guidelines (EPA Code of Federal Regulations [CFR] 40 Part 230), and whether the permit approval is in the public interest. The Section

404(b)(1) Guidelines (Guidelines) were developed by the U.S. EPA in conjunction with the USACE, and allow the discharge of dredged or fill material into the jurisdictional waters (i.e. WUS) only if there is no practicable alternative which would have less adverse effects. The Guidelines state that the USACE may not issue a permit if there is a least environmentally damaging practicable alternative (LEDPA) to the proposed discharge that would have lesser effects on WUS and not have any other significant adverse environmental consequences. According to the Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures has been followed, in that order. The Guidelines also restrict permitting activities that violate water quality or toxic effluent (The U.S. EPA defines "effluent" as "wastewater, treated or untreated, that flows out of a treatment plant, sewer, or industrial outfall.") standards, jeopardize the continued existence of listed species, violate marine sanctuary protections, or cause "significant degradation" to WUS. In addition, every permit from the USACE, even if not subject to the Section 404(b)(1) Guidelines, must meet general and regional requirements. See 33 CFR 320.4 for general policies for evaluating permit applications. Below in Figure 1 is a graphical depiction of the boundary of WUS under Section 10 of the RHA and Section 404 of the CWA.

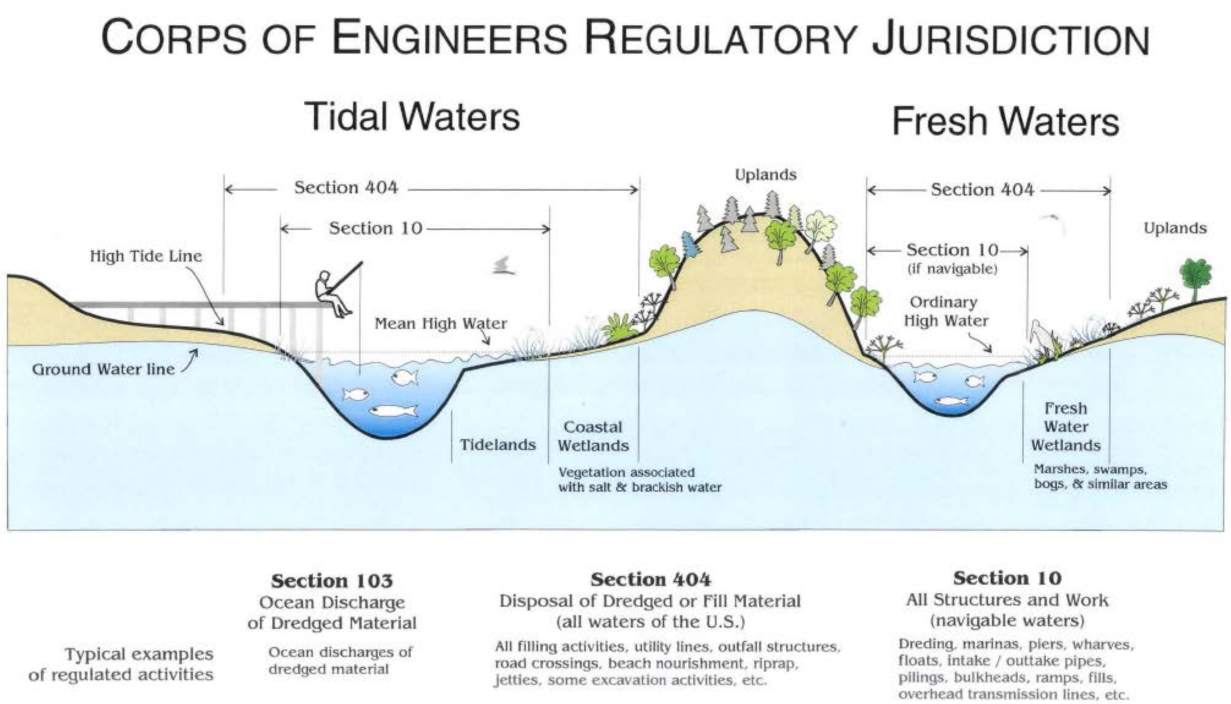

Figure 1. Regulatory Boundaries in Waters of the United States.

1.4.1.2 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) (United States Code (USC) Sections 3501 et seq., as amended in 1990 under the Coastal Zone Act Reauthorization Amendments), administered by the National Oceanic and Atmospheric Administration's (NOAA) Office of Ocean and Coastal Resource Management, provides for management of the nation's coastal resources and balances economic development with environmental conservation. The national goal for the CZMA program is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone."

The purpose of the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990 is to improve the management of the coastal zone and enhance environmental protection of coastal zone resources. Section 6217 of CZARA seeks to address Non-Point Source (NPS) pollution problems in coastal waters by implementing the Coastal Nonpoint Pollution Control Program (CNPCP). The CNPCP is a statewide coastal zone program that establishes and oversees a set of management measures to prevent and reduce NPS pollution from six sources: forestry, agriculture, urban areas, marinas, hydromodifications, and wetlands and riparian areas. The CNPCP also includes a monitoring and tracking condition to ensure that the management measures are being implemented. This program is administered jointly by the EPA and the NOAA.

Section 307 of the CZMA, requires federal agency activities and development projects affecting any coastal use or resource to be undertaken in a manner consistent to the maximum extent practicable with the state's Coastal Zone Management (CZM) program. Also, activities requiring a federal permit or license, and activities conducted with federal financial assistance, that affect coastal uses and resources must be conducted in a manner consistent with the state's CZM program. The CZMA federal consistency provision ensures that federal agencies cannot act without regard for, or in conflict with, state policies that have been officially incorporated into a state's CZM program. Federal actions affecting any coastal use or resource must be reviewed by the state CZM program to ensure that proposed activities are consistent with state enforceable policies.

Section 6217 of CZARA seeks to address NPS pollution problems in coastal waters by implementing the Coastal Nonpoint Pollution Control Program (CNPCP). The CNPCP is a statewide coastal zone program that establishes and oversees a set of management measures to prevent and reduce NPS pollution from six sources: forestry, agriculture, urban areas, marinas, hydromodifications, and wetlands and riparian areas. The CNPCP also includes a monitoring and tracking condition to ensure that the management measures are being implemented. This program is administered jointly by the EPA and the NOAA.

In 1961, Act 187, SLH 1961 Hawai'i's cornerstone state land use law was codified as HRS chapter 205 with the intent to *"preserve, protect, and encourage the development of the lands in the State for those uses to which they are best suited for the public welfare."* The program is administered by the State Land Use Commission and oversees amendments to the state land use districts, designation of important agricultural lands, declaratory rulings, and special permits (>15 acres in agricultural and rural districts).

In 1977, Hawaii enacted HRS Chapter 205A, Hawaii CZM Program, to carry out the State's CZM policies and regulations under the CZMA. The CZM area encompasses the entire State, including all marine waters seaward, to the extent of the State's police power and management authority, including the 12-mile U.S. territorial sea and all archipelagic waters. As a result, all projects in Hawaii are within the CZM area and are subject to consistency with the objectives and policies of the Hawaii CZM Program. The CZM Federal Consistency Certification is reviewed by the State Office of Planning (OP).

The Hawaii CZM Program focuses on ten policy objectives (HRS Chapter 205A):

1. Recreational resources;

(A) Provide coastal recreational opportunities accessible to the public.

2. Historic resources;

(A) Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

3. Scenic and open space resources;

(A) Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

4. Coastal ecosystems;

(A) Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

5. Economic uses;

(A) Provide public or private facilities and improvements important to the State's economy in suitable locations.

6. Coastal hazards;

(A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

7. Managing development;

(A) Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

8. Public participation;

(A) Stimulate public awareness, education, and participation in coastal management.

9. Beach protection;

(A) Protect beaches for public use and recreation.

10. Marine resources;

(A) Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

The Special Management Area (SMA) permit was established in 1975 with the enactment of Act 176, known as the Shoreline Protection Act. The Hawaii legislature in enacting Part II of HRS Chapter 205A found that: *"special controls on developments within an area along the shoreline are necessary to avoid permanent losses of valuable resources and the foreclosure of management options, and to ensure that adequate access, by dedication or other means, to public owned or used beaches, recreation areas, and natural reserves is provided."* Figure 2 below provides a spatial perspective for where the SMA fits within the larger CZM network.

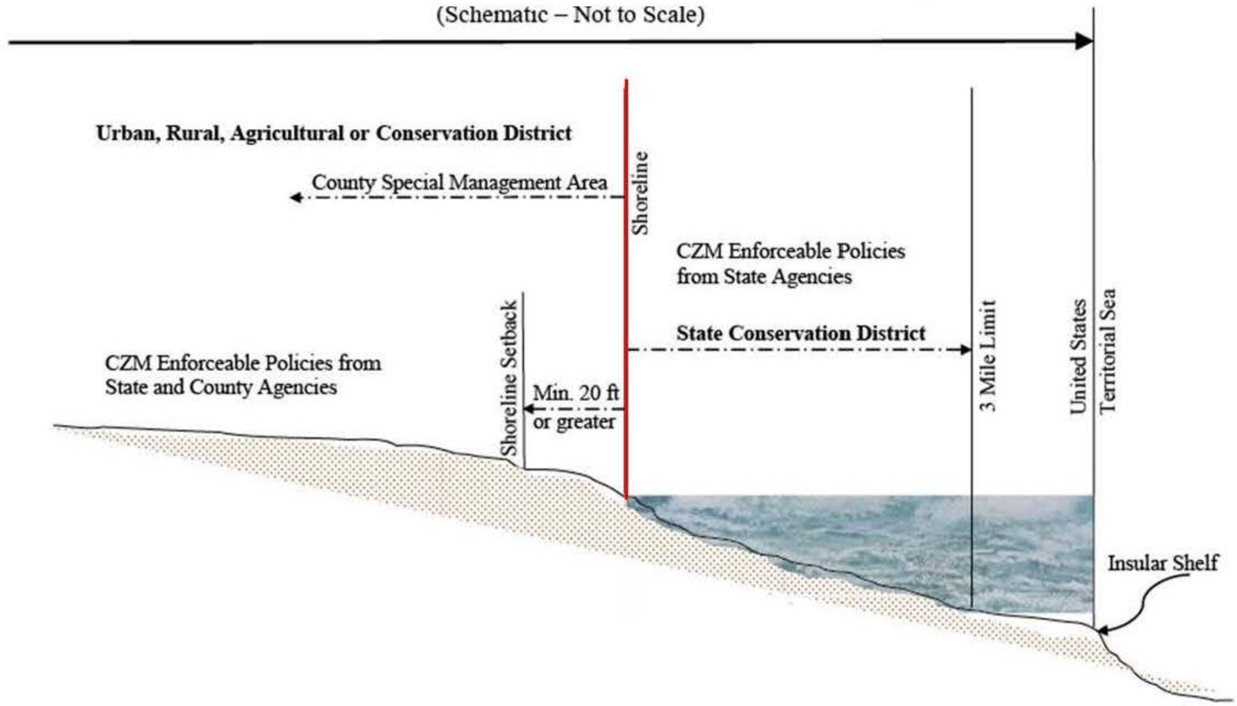

Figure 2. Hawaii CZM Network- A Spatial Perspective.

The Hawaii OP administers HRS Chapter 205A, the CZM law. The purpose of HRS Chapter 205A is to *"provide for the effective management, beneficial use, protection, and development of the Coastal Zone."* The SMA permitting system is part of the CZM Program approved by Federal and State agencies. The SMA permitting system regulates all types of land uses and activities under a broad definition of "development" within the SMA. For an SMA permit approval the proposed action must be determined to be consistent with the CZM objectives and policies, and SMA guidelines or conditions (unless otherwise exempt). The SMA permit must precede any other permit authorization pertaining to an development within the SMA (HRS 205A 28 and 29). Some such SMA conditions may include:

- Provision of public shoreline access;
- Preservation of important archaeological sites;
- Building height restrictions;
- Boundary setback requirements to preserve coastal views from public access;
- Drainage improvements to mitigate flooding or to control siltation in coastal waters.

The shoreline setback boundaries have been established to conserve open space, minimize interference with natural shoreline processes; and minimize loss of improvements due to erosion (HRS § 205A-2(c)(9)(A)). The shoreline certification process was created to establish a baseline from which each County (utilizing its regulations) can measure the start of the "no build zone". This boundary is determined in the field utilizing survey techniques. The Department of Land and Natural Resources (DLNR) looks at the vegetation line and debris line along the shoreline though other types of evidence such as elevation, salt deposits, rock coloration, and other geomorphologic indicators, biological indicators, neighboring shorelines, anecdotal evidence provided by people familiar with the area, and evaluation of seasonal wave run-up statistics and models may be utilized.

1.4.1.3 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), which was originally passed in 1974, protects public health by regulating the nation's drinking water supply. It is administered by the EPA and implemented by the DOH Safe Drinking Water Branch (SDWB). The SDWB is responsible for protecting the State's drinking water resources, including both surface and groundwater sources, and ensures that public water systems meet federal and state health-related standards for drinking water. The DOH's Wastewater Branch (WWB) is also responsible for protecting drinking water and public health by ensuring that the use and disposal of wastewater does not contaminate water sources.

1.4.1.4 Endangered Species Act

The purpose of the Endangered Species Act (ESA) is to protect and promote recovery of imperiled species and the ecosystems upon which they depend. The federal ESA is administered by NOAA Fisheries Service for marine mammal species and anadromous species. USFWS administers the ESA for freshwater fish species, and for birds, mammals, reptiles, amphibians, invertebrates, and plants.

Three provisions of the ESA may apply directly to stormwater management: Section 4(d) rules, Section 7 consultations and Section 10 habitat conservation plans.

Section 4(d) of the ESA requires USFWS or NOAA Fisheries Service to implement protective measures that prevent further damage to threatened species. Section 4(d) applies only to threatened species; endangered species are afforded full legal protection without room for maneuvering. "Take" of any species listed as endangered is prohibited by the ESA. Take of threatened species may be allowable under permit, provided project-related take does not interfere with species survival or recovery.

ESA compliance involves determination of effect on listed species, and may lead to consultation with USFWS/NOAA Fisheries Service under Section 7.

1.4.1.5 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) is the primary law governing marine fisheries management in U.S. Federal waters. It establishes a national program for the conservation and management of the fishery resources of the United States to prevent overfishing, rebuild overfished stocks, ensure conservation, facilitate long-term protection of essential fish habitats (EFH), and realize the full potential of the Nation's fisheries. In accordance with Section 305(b) of the MSA, Funding Agencies must consult with NOAA's NMFS regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect EFH. For additional guidance, please view the EFH Regulatory Guidelines (http://www.habitat.noaa.gov/pdf/efhregulatoryguidelines.pdf).

1.4.2 State Requirements:

The state statutes and rules governing water quality are captured in the Hawaiʻi Revised Statutes (HRS) and the Hawaiʻi Administrative Rules (HAR).

Water quality management in Hawaiʻi is guided by the State Water Code (HRS Chapter 174C) and the Hawaiʻi Water Plan. The Hawaiʻi Water Plan serves as a framework for comprehensive water resource planning to address the State's water quantity and quality issues. Specifically, it sets forth an integrated and coordinated approach to managing the State's waters and consists of plans prepared and implemented by the State DOH, the DLNR, the Department of Agriculture (HDOA), and the four counties of Hawaii. These agencies and their respective plans address the State's water protection policies, water quality, water needs, and sustainable water use. DLNR's Water Resource Protection Plan and DOH's Water Quality Plan provide the overall legal and policy framework that guides the development, conservation, and use of water resources. DLNR's State Water Projects Plan and HDOA's Agricultural Water Use and Development Plan provide guidance for the State's agricultural water needs and development. The information from these plans is integrated into County Water Use and Development Plans, which set forth the broad allocation of water use within each county.

The DOH Environmental Management Division (EMD) establishes the State's water quality standards and is the lead agency responsible for protecting the State's surface and groundwater quality. The EMD administers the State's surface water and groundwater quality assessment, management, permitting, and enforcement programs through the Clean Water Branch (CWB), the Safe Drinking Water Branch (SDWB), and the Wastewater Branch (WWB).

The DOH-CWB is responsible for implementing the Surface Water Quality Management Program for recreational and ecosystem protection. This is accomplished through a coordinated approach that includes water quality monitoring and assessment, engineering and permitting, water quality violation enforcement, and polluted runoff control management.

Pursuant to the CWA and HRS Chapter 342D, HAR Chapter 11-54 (Water Quality Standards) establishes Hawaiʻi's water quality standards, including limits for conventional and toxic pollutants. Chapter 11-54 also classifies the State's water bodies and prohibits unauthorized discharges from both point source and NPS in inland and marine waters. HAR Chapter 11-55 (Water Pollution Control) provides for the prevention, abatement, and control of new and existing water pollution, primarily through permitting and permit compliance. Chapters 11-54 and 11-55 are administered by the CWB and are reviewed and amended every three years or as needed.

Sections 305(b) and 303(d) of the CWA drive Hawaiʻi's surface water quality assessment efforts. Under Section 305(b), the State is required to assess, characterize, and report the quality of its surface waters every two years. Under Section 303(d), the State identifies impaired waters and develops Total Maximum Daily Loads (TMDLs) to address these impairments. Impaired waters do not meet the State's numeric water quality criteria, which are governed by HAR Chapter 11-54. The State of Hawaiʻi Water Quality Monitoring and Assessment Report, known as the Integrated Report, addresses 305(b) and 303(d) requirements and is submitted to the EPA and U.S. Congress by the DOH-CWB every two years. The DOH CWB Monitoring and Analysis Section is responsible for monitoring State surface waters, updating water quality standards, conducting assessments for the 303(d) list of impaired waters and the 305(b) report, and developing TMDLs.

The Hawai'i counties may also become involved in the management of CWA resources through the implementation of their grading ordinances and other permit or approval processes. One county, the City and County of Honolulu, has incorporated into its SMA ordinance (Chapter 25, ROH, "Shoreline Management") provisions for wetland protection in the permitting process, and for rulemaking and enforcement pertaining to the conservation, protection, and restoration of wetlands.

1.4.2.1 National Pollutant Discharge Elimination System (NPDES) Program

The Hawai'i legislature enacted HRS Chapter 342D (Water Pollution) and Chapter 342E (NPS Pollution Management and Control) to address point source and NPS water pollution in the State. HRS Chapter 342D is Hawai'i's equivalent to the CWA and states that *"[n]o person, including any public body, shall discharge any water pollutant to state waters, or cause or allow any water pollutant to enter state waters except in compliance with this chapter, rules adopted pursuant to this chapter, or a permit or variance issued by the director [of the DOH]."* Under Chapter 342D, the DOH has the authority to administer, enforce, and carry out all laws, rules, and programs relating to both point source and NPS pollution.

1.4.2.1.1 Municipal Separate Storm Sewer Systems (MS4)

Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of storm water discharges including:

A. A discharge with respect to which a permit has been issued under this section before February 4, 1987.

B. A discharge associated with industrial activity.

C. A discharge from a municipal separate storm sewer system serving a population of 250,000 or more.

D. A discharge from a municipal separate storm sewer system serving a population of 100,000 or more but less than 250,000.

E. A discharge for which the Administrator or the State, as the case may be, determines that the stormwater discharge contributes to a violation of a water quality standard or is a significant contributor of pollutants to WUS.

An MS4 is defined as *"any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over storm water, that is designed or used for collecting or conveying storm water."* Currently in O'ahu and Maui counties, a portion of urban runoff is controlled through NPDES MS4 permits. MS4 permits require these counties to develop and implement stormwater management program plans, which include pollution prevention measures. The CNPCP also devotes several management measures to the prevention and reduction of pollution generated by development and maintenance of roads, highways, bridges, and facilities in urban areas.

1.4.2.1.2 Construction General Permit

The DOH-CWB amended HAR, Chapter 11-55 and readopted the NPDES General Permits in HAR, Chapter 11-55 (Appendices A through L). These NPDES General Permits, became effective on December 6, 2013. The NPDES General Permit in Appendices B through L cover numerous discharges of stormwater from various construction and operational activities., The permit regulates storm water discharges from construction sites that result in a Disturbed Soil Area (DSA) of one acre or greater, and/or are smaller sites that are part of a larger common plan of development. By law, all storm water discharges associated with construction activity where clearing, grading, and excavation result in soil disturbance of at least one acre must comply with the provisions of the Construction General Permit. A construction activity that results in soil disturbances of less than one acre is subject to this Construction General Permit if there is potential for significant water quality impairment resulting from the activity as determined by the DOH-CWB. Operators of regulated construction sites are required to develop storm water pollution prevention plans (SWPPP); to implement sediment, erosion, and pollution prevention control measures; and to obtain coverage under the Construction General Permit.

FHWA and/or HDOT, as the agency responsible for construction management and oversight for transportation projects, are responsible for obtaining the NPDES permit and for signing certification statements (when necessary). FHWA and/or HDOT are also responsible for ensuring that all permit conditions are included in the construction contract and fully implemented in the field during construction.

1.4.2.2 Section 401 Water Quality Certification Permitting

Under Section 401 of the CWA, any project requiring a federal license or permit that may result in a discharge to a water of the United States must obtain a 401 Certification, which certifies that the project will be in compliance with state water quality standards. The most common federal permits triggering 401 Certification are CWA Section 404 permits issued by the USACE. The 401 permit certifications are obtained from the DOH-CWB, dependent on the project location, and are generally required before the USACE issues a 404 permit.

In some cases, the DOH-CWB may have specific concerns with discharges associated with a project. As a result, the DOH-CWB may issue a set of requirements that define activities, such as the inclusion of specific features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. These requirements can be issued to address both permanent and temporary discharges associated with a project.

1.5 Considerations for working in Riverine Systems

Rivers, Streams, drainages, gulches and other aspects of the riverine systems involve complex processes that do complicated work. In their natural state, streams gather, store, and move water. However, it is important for understanding stream processes to realize that streams and rivers are not only moving water (streams also move sediment, nutrients, and woody debris from mountain peaks to the sea).

Human land uses that significantly alter the ability of a creek to transport water and sediment will likely cause a stream to become unstable and increase the likelihood that catastrophic erosion or sedimentation may occur during a flood event. The relationship between water in a stream and its ability to transport sediment is shown as a balancing scale (Figure 3). When any one or more of the variables of this scale change, the system is no longer in balance, and aggradation or degradation of the river/stream bed and banks may occur. Given time and freedom to make adjustments, a stream will adjust its slope and sediment transport capability toward an equilibrium condition.

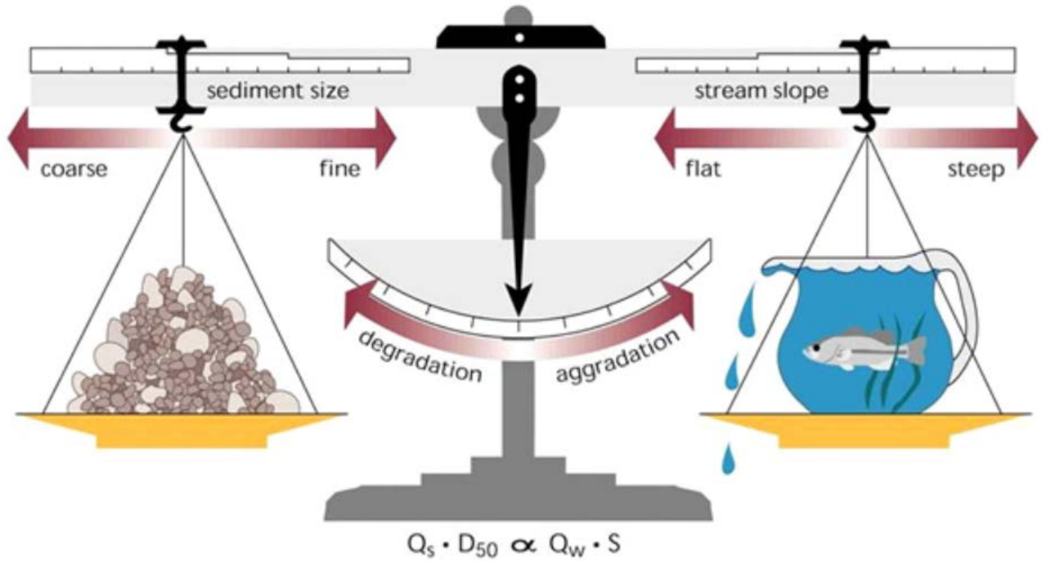

Figure 3: Lane's Balance of Sediment Supply & Sediment Size with Slope (energy grade) & Discharge

Throughout North America, river scientists and managers are now bringing this principle of river "stability" into the management of river channels by recognizing that stable rivers carry water, sediment and debris, even during high water, without drastic changes occurring in the depth, width, length, or slope of the channel. The term "dynamic equilibrium" is often used to describe a naturally stable stream channel. The channel may shift its location over time but ultimately will maintain consistent dimensions and habitat values. Channels remain stable when they are not impeded by unnatural constrictions like undersized transportation structures such as bridges and culverts and have access to a vegetated floodplain. When development changes the relationship of the river with its floodplain or alters the ability of a channel to transport its water and sediment load, it becomes increasingly difficult to protect this infrastructure.

Fluvial (river-related) erosion refers to streambed and streambank erosion associated with the sudden and catastrophic physical adjustment of stream channel dimensions (width and depth) and location that can occur during elevated discharges. Much of this damage occurs where rivers and streams have been separated from their floodplains by some kind of development (either temporarily or permanently) thus concentrating erosive energy within the channel. Other examples are where rivers are unable to transport their sediment due to a constriction in the channel (e.g. culvert, weir, diversion structure, road embankment) which creates a sediment deficit downstream, or where excessive inputs (e.g. massive soil erosion from a burn or landslide scar) build up the river bed and exacerbate overbank flows. In these instances, a stream is likely to become destabilized and is more prone to sudden lateral or vertical shifting which may produce unexpected consequences for surrounding landowners. The dollar cost of such damage may well be equaled by other economic losses including diminished recreation opportunities, impaired ecological functions, and long-term channel instability.

Cutting a river off from its floodplain by building levees, berms and roadways, armoring with stone, or dredging a channel will cause a river to adjust through physical change. The result of containing greater flows in the channel (i.e., preventing access to the floodplain) is to increase the erosive power (friction) that must be resisted by the channel boundary materials; i.e., the rocks, soil, vegetation, or manmade structures that make up the bed and banks of the river. Figure 4 shows a common scenario of channel evolution process as described by Stanley Schumm (1984). It is important to note that this diagram only illustrates channel response at one location. There are equally profound physical adjustments that occur upstream and downstream from the site of a river corridor alteration as bed degradation (head cuts) migrate up through the system and aggradation in the form of sedimentation occurs downstream. Similarly another common form of channel evolution may occur where a stream starts in a stable condition but is overloaded with sediment from upstream sources and quickly aggrades (i.e. fills in) its channel spilling out onto the surrounding floodplain with significant destructive potential.

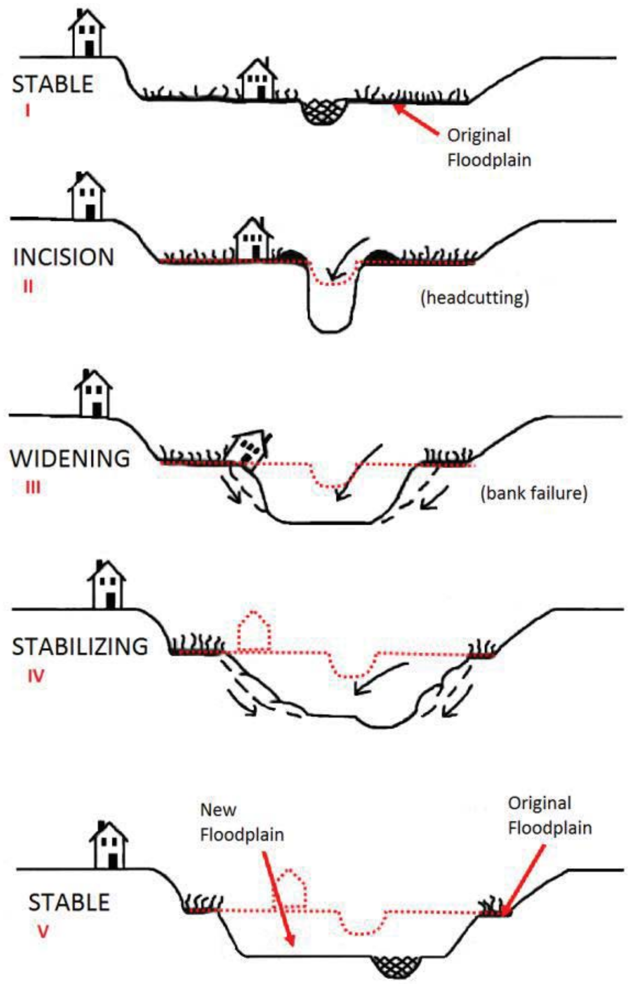

Figure 4: Channel Evolution Process (Source: Schumm, S., 1984).

Understanding fluvial processes is paramount when designing transportation infrastructure that must border, cross, or interact with a riverine system. It is important to recognize the temporal aspect of channel response to change. Fluvial systems are energized by episodic events. Channel adjustment in response to management practices or encroachments may take effect immediately but may also persist for decades depending on the sensitivity and morphology of the stream channel, the magnitude of alteration, and the frequency of high flow events. Consideration of these processes and efforts to maintain stable channel dimension and access to riverine floodplains should be considered during design of permanent and temporary transportation structures within the riverine system.

1.6 The Riparian Zone

Riparian areas are unique vegetation communities that occur adjacent to waterways and wetlands, and provide habitat for numerous floral and faunal species. They generally occupy transitional areas between aquatic and upland habitats, and may function as vegetative buffers for aquatic resources. The riparian zone can be rich with diversity os plant species occupying several vegetative layers. Riparian vegetation composition and structure is regulated by: (1) frequency, magnitude, duration, and seasonal timing of stream flooding and (2) subsurface moisture conditions.

The condition of the riparian zone adjacent to streams has a critical impact on water quality. Permanent and deeply rooted stream bank vegetation slows run-off of nutrients and pollutants, reduces sedimentation and solar heating, provides wildlife habitat, and overhead cover and organic food supply for aquatic species. Riparian areas typically do not satisfy the USACE regulatory definitions for wetlands (i.e. hydrophytic vegetation, hydric soils, and hydrology) and frequently occur in locations transitional between these jurisdictional wetlands and adjoining uplands. However, riparian areas perform many of the same functions as do wetlands, including maintenance of water quality, storage of floodwaters, and enhancement of biodiversity. Although riparian habitats are often combined with wetlands (as a result of their intimate relationship to the hydrological regime), riparian areas differ from wetlands in that they are generally linear, more terrestrial (less hydric), and are often dependent on a natural disturbance regime relating to flooding and stream dynamics. Figure 5 depicts a conceptual riparian cross section.

In Hawai'i, the coastal nonpoint pollution control program has defined the Hawaii Riparian Zone as *Vegetated ecosystems along a waterbody through which energy, materials, and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent waterbody. These systems encompass wetlands, uplands, or some combination of these two land forms. They will not in all cases have all of the characteristics necessary for them to be classified as wetlands.*

A healthy riparian zone provides many important benefits including:

- Water Quality Protection;
- Flood Control;
- Streamflow Maintenance;
- Water Temperature;
- Wildlife Habitat;
- Recreation Benefits; and
- Economic Benefits

Riparian vegetation intercepts surface runoff and associated pollutants (sediment, nitrogen, phosphorous, pesticides, heavy metal, etc.) and can buffer their effects on water quality. Loss of riparian areas reduce water quality values, faunal populations, and can result in property damage or loss of lands from bank erosion. Removal of riparian vegetation results in increased water temperatures and decreased dissolved oxygen. The loss of shade exposes soils to drying out by wind and sunlight and reduces the water storage capacity of the riparian area. Loss of riparian vegetation causes streambank erosion. The riparian zone should be considered during project design and efforts made to promote riparian function in project design. Suitable riparian buffer widths are highly variable and are dependent on several variables including slope, soil type, and vegetation mix.

Riparian area health and streambank stability are simply a reflection of the conditions in the surrounding landscape. When studying the river, stream, gulch in your project area, it is important to keep in mind that extensive stretches of eroding streambanks are only symptoms of an unhealthy system and are not the true cause of the problems.

Healthy streams and riparian areas are naturally resilient which allows them to accommodate and recover from natural disturbances such as flood events. Streambank stability is a function of a healthy riparian area. When the riparian area is degraded, the stream health will often degrade in kind and its resiliency to natural disturbances will diminish. Excessive flooding, erosion, and sedimentation will often increase. Degraded riparian areas are less effective for storing floodwaters. As more sediment is deposited, water quality is also diminished. High levels of sediment in a stream suffocate fish, fill in spawning areas and pools, and kill aquatic invertebrates.

As additional sediment is deposited in streams, the streambed may aggrade and become shallower, forcing water to spread out and cause bank erosion. Eroding banks contribute to sedimentation and lead to a wide shallow stream with little habitat value. These factors result in significant reductions in aquatic stream life. Excessive bank erosion causes wider, shallower channels and lowers the water table. A shallower stream also has a lower dissolved oxygen content and a higher temperature, which supports less aquatic life.

In other streams, headcutting may occur, which is the cutting of the streambed to a lower bed elevation. As the streambed lowers, the water table also lowers. This causes riparian vegetation to die-off and be replaced with upland vegetation, which is less successful in stabilizing the streambank. In either case, headcutting or aggradation of the streambed greatly diminishes the natural resiliency of riparian areas.

The first step to designing a transportation project within the riparian zone is to determine the best way to find ways to promote riparian functions while still meeting project needs. By doing so, mitigation for project impacts to aquatic resources can often be completed in close proximity to project impacts. While preservation and conservation of healthy streams and riparian areas should receive high priority, it is clear that restoration of degraded areas is also equally as necessary during the construction of transportation projects.

Prior to roadway construction, rivers and streams generally meandered back and forth along smooth, sinuous paths, with well establish floodplains; the width of these meanders and floodplains varying primarily due to valley slope. However, when man-made structures such as bridges and culverts are placed along stream channels, this natural pattern is interrupted as the streams are forced to flow around tight bends or through narrow constrictions. Quite often, these impacts are unavoidable to meet the transportation needs. Protection of the roadway is usually accomplished through solely traditional engineering practices. Alternatively utilizing solely natural stream/channel design on projects is impracticable due to design requirements. Sometimes plants fail to grow or are replaced by invasive species. Plants and other natural components are harder to model for stability due to buoyancy, decomposition, and other factors. Plants and other natural components may be subject to scouring. Plants can also be uprooted by freezing and thawing, flood flows, and debris loads. Livestock and wildlife often feed on the plants and may destroy them. Because of these variables, utilizing solely bioengineering practices may require the project to receive more frequent maintenance for a period of time, especially early in the project life until vegetation reaches maturity.

However, traditional roadway design principles can be partnered with appropriate bioengineering practices to improve synergy between the roadway and riparian systems. See Streambank Stabilization BMP in Chapter 5 for more details. Common bioengineering principles that can be evaluated include:

- Fiberschines
- Brush Mattress
- Brush Layering
- Stake Plantings
- Pole Plantings
- Post Plantings
- Brush/Tree Revetment
- Brush Trench
- Vertical Bundles
- Live Wattles or Fascines
- Rootwad Installation
- Living Cribwalls
- Engineered Log Jams
- Boulder Revetments
- Rock Toe Revetments
- Rock/Log Vanes
- Rock/Log Weirs
- Erosion Control Fabric
- Etcetera!!!

1.6.1 Practices to Promote

- Protect or establish native or non-invasive shrubs, trees, or other vegetation along streams to help prevent bank erosion, trap sediment and filter other pollutants.
- Maximize riparian buffer width while balancing sociologic and economic constraints
- Consider riparian functions during project design. Plan land disturbing activities to protect riparian zones.
- Integrate bioengineering concepts where practicable.

1.6.2 Practices to Avoid

- Straightening sections of streams.
- Removing streamside shrubs, trees and other vegetation.
- Excessive hard armoring in riparian zone including the stream channel. [

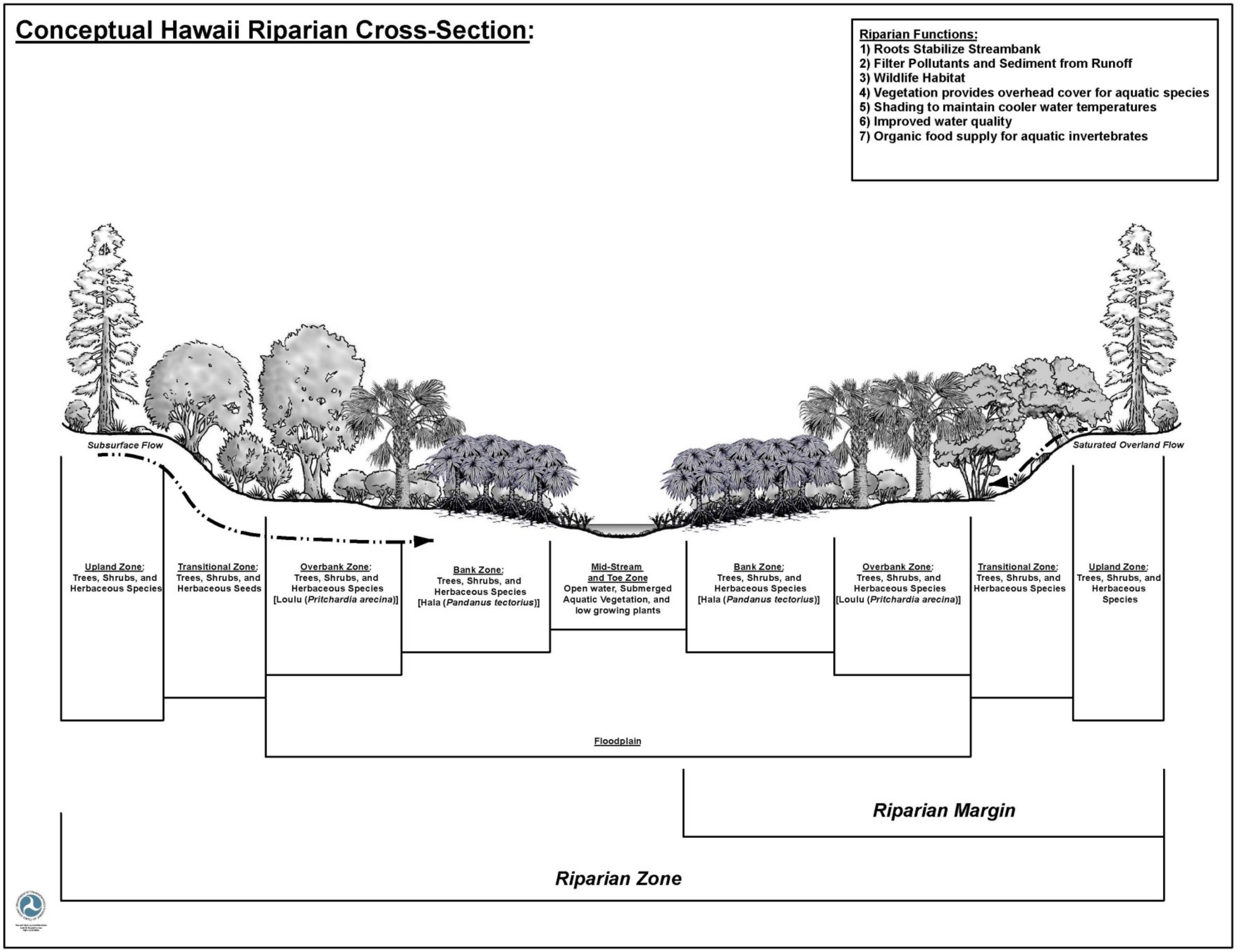

Figure 5: Conceptual Riparian Cross Section