

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
Honolulu, Hawai'i

July 22, 2022

**Board of Land and
Natural Resources
State of Hawai'i
Honolulu, Hawai'i**

REGARDING: Approval of the Mauna Kea *Comprehensive Management Plan 2022 Supplement: Management Actions Update*

PERMITTEE: University of Hawai'i at Hilo

REPRESENTATIVE: Gregory Chun, Executive Director, Center for Maunakea Stewardship

LANDOWNER: State of Hawai'i; leased to the University of Hawai'i under General Leases S-4191 (Mauna Kea Science Reserve) and S-5529 (Halepōhaku), as well as a non-exclusive roadway easement

LOCATION: Mauna Kea Science Reserve, Ka'ōhe, Hāmākua District, Hawai'i

TAX MAP KEYS: (3) 4-4-015:009 (Maunakea Science Reserve), 11,287.854 acres
(3) 4-4-015:012 (Halepōhaku), 19.261 acres
(3) 4-4-015:001 (portion; Roadway Easement), 70.798 acres

SUBZONE: Resource

ATTACHMENTS: Exhibit 1: Comprehensive Management Plan 2022 Supplement: Management Actions Update
Online: 2022 Supplement: [Volume 1](#). [Volume 2](#)
[Outcome Analysis Report](#)
[2009 Mauna Kea Comprehensive Management Plan](#)

ONLINE LIBRARY: dlnr.hawaii.gov/occl/maunakea-management

BACKGROUND

On April 9, 2009, the Board of Land and Natural Resources (Board) approved the *Mauna Kea Comprehensive Management Plan, UH-Management Areas* (2009 CMP). The UH Management Areas are comprised of the Mauna Kea Science Reserve, the midlevel facilities at Halepōhaku, and the Mauna Kea Access Road. The 2009 CMP incorporated

management actions of previous management documents, including the 1995 Management Plan for UH Management Areas and the 2000 Mauna Kea Master Plan.

The 2009 CMP provided a framework and management guidelines ranging from the preservation of cultural and natural resources to the management of the built environment, construction activities, and outreach and education.

The 2009 CMP contained 103 management actions and associated reporting requirements. Four Resource subplans were approved by BLNR on March 25, 2010: the *Natural Resources Management Plan*; *Cultural Resource Management Plan*; *Public Access Plan*; and *Decommissioning Plan*.

In January 2021 the Center for Maunakea Stewardship (CMS) presented the *Maunakea Comprehensive Management Plan Outcomes Analysis Report* (OAR) to the Board, a prerequisite under before considering updates and revisions to the 2009 CMP. The OAR assessed the status of the natural, historical, and cultural resources in the UH Management Areas, summarized the work that had been conducted regarding the management actions contained in the 2009 CMP, and outlined the progress the University had made towards meeting the CMP's stated goals. The OAR forms the basis for the proposed 2022 Supplement.

The bulk of the 2009 CMP remains unchanged; the proposed supplement replaces Section 7, Management Component Plans, of the 2009 CMP, which grouped management actions into the following components:

- 7.1 Understanding and Protecting Mauna Kea's Resources
 - 7.1.1 Native Hawaiian Cultural Resources
 - 7.1.2 Natural Resources
 - 7.1.3 Education and Outreach
 - 7.1.4 Astronomy Resources
- 7.2 Managing Access and Use
 - 7.2.1 Activities and Uses
 - 7.2.2 Permitting and Enforcement
- 7.3 Managing the Built Environment
 - 7.3.1 Infrastructure and Maintenance
 - 7.3.2 Construction Guidelines
 - 7.3.3 Site Recycling, Decommissioning, Demolition and Restoration
 - 7.3.4 Considering Future Land Use
- 7.4 Managing Operations
 - 7.4.1 Operations and Implementation
 - 7.4.2 Monitoring, Evaluation, and Updates
- 7.5 1995 Management Plan Controls

The 2022 Supplement applied the concept of adaptive management to update the management actions. The 2022 Supplement groups the management actions into the following twelve categories:

- Cultural Resources
- Natural Resources
- Education and outreach activities
- Astronomical resource, activities, and uses
- Activities and uses
- Permitting and enforcement
- Infrastructure and maintenance
- Construction guidelines
- Site recycling, decommissioning, demolition, and restoration
- Considering future land uses
- Operations and implementation
- Monitoring, evaluation, and updates

Each of these sections in the 2022 Supplement contains a discussion of the desired outcomes and the associated management actions. In some cases, the management actions are identical to those in the 2009 CMP, in others they have been substantially altered to (a) be consistent with the Maunakea Administrative Rules (b) address lessons learned by CMS regarding achievement of the CMP's objectives, or (c) address input from resource experts, Native Hawaiian cultural practitioners, agencies, and others familiar with the resources. The fourteen management actions that have been completed are listed in Chapter 2 of the 2022 Supplement.

The 2022 Supplement containing the updated management actions is attached as an exhibit to this report. The full Volume 1, containing the OAR and a summary of "Draft CMP Supplement outreach, input, and related plan revisions," and Volume 2, containing press releases, input and comments, meeting notes, and written testimony, are available in the online Mauna Kea documents library maintained by the Office of Conservation and Coastal Lands (OCCL) at dlnr.hawaii.gov/occl/maunakea-management.

The online library also contains the yearly reports presented by the University to the Board, documents from the independent evaluation of the implementation of the 2009 CMP by Ku'iwalu that DLNR commissioned, reports from the State Auditor, decommissioning plans, and active Conservation District Use Permits.

The University of Hawai'i Board of Regents approved the 2022 Supplement on May 19, 2022, and recommended approval by the Board of Land and Natural Resources. The 2022 Supplement will be effective upon BLNR approval.

ACT 255, ESTABLISHING A NEW MAUNA KEA STEWARDSHIP AND OVERSIGHT AUTHORITY

On July 7, 2022, Governor David Ige signed House Bill 2024 CD1 into law as Act 255. The Act establishes the Mauna Kea Stewardship and Oversight Authority (Authority), and transfers the leases, easements, and permits held by the University of Hawai'i on Mauna Kea to the Authority. It will be placed within DLNR for administrative purposes.

During the transition period the University of Hawai'i will continue to be responsible for administering the 2009 CMP as updated and amended by the 2022 Supplement. Under Act 255 the transition period could take up to five years, or until 2028. The Authority will then either assume responsibilities for implementing the CMP or develop a new comprehensive management plan, as required under the Conservation District Rules.

DISCUSSION AND RECOMMENDATION

The Office of Conservation and Coastal Lands finds that the 2009 Comprehensive Management Plan provided the University with a strong framework for managing the valuable cultural and natural resources on Mauna Kea. The 2022 Supplement was developed in consultation with DLNR as well as other federal, state, and local stakeholders, and after extensive public outreach. It applies an adaptive management strategy to update the existing management actions and will continue to provide strong guidance to the University or to any Authority that assumes management responsibilities on Mauna Kea.

It will be one of only two plans applicable to UH-Management Areas, the other being the Master Plan for the University of Hawai'i Maunakea Lands, E Ō I Nā Leo (Listen to the Voices), adopted by the UH Board of Regents on January 20, 2022.

In the interest of effective resource management, the Office of Conservation and Coastal Lands recommends that the Board of Land and Natural Resources approve the 2022 Supplement updating the 2009 CMP's management actions.

Respectfully submitted,

S Michael Cain

Michael Cain, Administrator
Office of Conservation and Coastal Lands

Approved for submittal:

Suzanne D. Case

Suzanne D. Case, Chairperson
Board of Land and Natural Resources

COMPREHENSIVE MANAGEMENT PLAN 2022 SUPPLEMENT: MANAGEMENT ACTIONS UPDATE VOLUME 1

COMPREHENSIVE MANAGEMENT ACTION MEU-2



APPROVED BY THE UNIVERSITY OF HAWAI‘I BOARD OF REGENTS ON MAY 19, 2022
*APPROVED BY THE BOARD OF LAND AND NATURAL RESOURCES ON **DATE***

PREPARED FOR:
University of Hawai‘i

PREPARED BY:
Planning Solutions, Inc.
Ho‘okuleana, LLC

MAY 20, 2022

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FOREWORD

In 2009 the Board of Land and Natural Resources (BLNR) approved the *Mauna Kea Comprehensive Management Plan; UH Management Areas* (2009 CMP) prepared by Ho‘akea, LLC dba Ku‘iwalu for the University of Hawai‘i (UH). Consistent with Hawai‘i Administrative



Rules (HAR) § 13-5-2, the CMP¹ is UH’s “comprehensive plan to manage multiple uses and activities in order to protect and conserve natural and cultural resources.” To achieve comprehensive management of the UH Management Areas, the 2009 CMP laid out 12 subjects, each with a desired outcome, and management actions (103 in total) designed to achieve the desired outcomes. As specified in the 2009 CMP, status reports and periodic

updates/supplements are to be conducted to ensure the management actions remain relevant and sufficient to achieve the desired outcomes based on experience, data, and learning. While annual reports on the status of UH’s implementation of the CMP have been submitted to BLNR, this is the first review and update that will benefit from an Outcome Analysis Report of the CMP management actions.

Ecosystem management is a complex process, so the 2009 CMP was developed and based on the principle of adaptive management. Adaptive management is defined in the 2009 CMP as:

[A] systematic process for continually improving management policies and practices for resource protection by learning from the outcomes of past and current management activities. Adaptive management recognizes that there is a level of uncertainty about the “best” policy or practice for a particular management issue, and therefore requires that each management decision be revisited in the future to determine if it is providing the desired outcome.

As discussed in the Introduction (CHAPTER 1) of this supplement, the bulk of the 2009 CMP remains unchanged by this supplement. The body of this supplement replaces Section 3.1.1 and Section 7 of the 2009 CMP; all other portions of the 2009 CMP are retained and unchanged. This supplement focuses primarily on continuing and adapting the CMP management actions using the principle specified above. Some management actions have been substantively changed based on what we have learned since 2009, while others have not. Where changes have been made, the reasons for the changes are provided. At their core, all changes are made to improve the quality and efficiency of management and UH’s ability to achieve the desired outcomes. What remains unwavering is UH’s sustained commitment to collaboratively manage multiple uses and activities

¹ Where “CMP” is used it refers to the Comprehensive Management Plan as supplemented. Where “2009 CMP” is used it refers to the *Mauna Kea Comprehensive Management Plan; UH Management Areas* as original adopted by BLNR in 2009.

to protect and conserve natural and cultural resources, building a global model of harmonious and inspirational stewardship that is befitting of Maunakea.

As UH was in the process of evaluating and updating the management actions originally set forth in the 2009 CMP, the 2021 State House of Representatives created the Mauna Kea Working Group (MKWG) to engage in a separate process to explore governance options for managing Maunakea. The MKWG prepared a report (“He Lā Hou Kēia Ma Mauna A Wākea: A New Day on Mauna A Wākea”) for the legislature. Like the 2009 CMP’s Cultural Anchor, the MKWG Report’s Foreword discusses Hawaiian creation chants and how Maunakea is considered the eldest offspring, born of Wakea and Papa, male and female energies from which all life springs. The MKWG Report also speaks of Kumu Kānāwai: the Native Hawaiian concept of environmental kinship. Traditionally, four kānāwai (laws of nature) govern our relationship to the ‘āina, ensuring the health of the ‘āina so that it will continue to nurture all life forms: Ho‘okikī Kānāwai - the edict of continuum; Kua‘ā Kānāwai – the edict of emergency; Kai‘okia Kānāwai – the edict of boundaries; and Kīho‘iho‘i Kānāwai – the edict of regeneration.

UH acknowledges and appreciates the holistic and integrated worldview of the kānāwai principles described in the MKWG Report. The principle’s symbiotic connections between the elements of nature, and of nature with humans, emphasizes the importance of sustaining balance between these forms. These principles are valuable guidelines for land use planning and decision making. UH’s management operations and plans are consistent with the kānāwai principles and are informed by Native Hawaiian knowledge, as discussed in the CMP.

UH will continue to use an adaptive and integrated approach that draws upon Native Hawaiian knowledge and methods as well as management tools from other sources as it implements applicable regulatory requirements.² UH recognizes that all scientific study includes systematic observation, measurement, interpretation, acknowledging patterns, and making decisions based on growing knowledge. This CMP Supplement further incorporates Native Hawaiian knowledge and directs that Native Hawaiian knowledge continue to be integrated as management actions are adapted in the future.

Maunakea is linked to the culture and cosmology of Native Hawaiian people, and for many the mauna is sacred. Its resources serve as the source for a diverse range of spiritual, research, educational, recreational, and subsistence experiences that all contribute to the significance of Maunakea. Its extraordinary blend of topographic and atmospheric qualities makes Maunakea the most desirable location for ground-based astronomy in the Northern Hemisphere, and the exceptional combination of alpine and subalpine ecosystems in a tropical environment make it ecologically unique as well. Managing for the protection of this range of valued resources, and the activities and uses that may impact them, requires the kind of holistic and integrated approach articulated in the 2009 CMP.

The University of Hawai‘i Board of Regents, the University of Hawai‘i at Hilo, the Center for Maunakea Stewardship, and those who are responsible for operating the astronomical facilities on the mauna understand that astronomy on Maunakea is a privilege that comes with the kuleana of stewardship which itself requires a comprehensive and cohesive management program given the unique nature of the resources we are responsible to protect. We embrace our responsibilities to Maunakea, the state, and the community we serve; those responsibilities are reflected in our 2022

² See also 2009 CMP Sections 2.2.2, 4.6, 5.1.1, 5.1.2, and 5.1.3 and CMP 2022 Supplement Section 3.4.4 regarding the integration of Native Hawaiian knowledge and methods.

Master Plan, our CMP, and HAR Chapter 20-26, entitled “Public and Commercial Activities on Mauna Kea Lands” (Maunakea Administrative Rules) that collectively and specifically outline our integrated and balanced approach.

LIST OF ACRONYMS

| | |
|--------|---|
| ACT | Activities and Uses |
| AMP | Archaeological Monitoring Plan |
| AR | Astronomical Resources |
| ACT | Activities and Uses |
| BLNR | Board of Land and Natural Resources |
| BMP | Best Management Practices |
| BOR | UH Board of Regents |
| BTP | Burial Treatment Plan |
| C | Construction Guidelines |
| CDUA | Conservation District Use Application |
| CDUP | Conservation District Use Permits |
| CIP | Capital Improvement Program |
| CMP | Comprehensive Management Plan |
| CMS | Center for Maunakea Stewardship |
| CR | Cultural Resources |
| CRMP | Cultural Resources Management Plan |
| CSO | Caltech Submillimeter Observatory |
| DBEDT | Department of Business, Economic Development & Tourism |
| DHHL | Department of Hawaiian Home Lands |
| DLNR | Department of Land and Natural Resources |
| DOFAW | Division of Forestry and Wildlife (DLNR) |
| DOCARE | Division of Conservation and Resources Enforcement (DLNR) |
| DoD | U.S. Department of Defense |
| EA | Environmental Assessment |
| EC | Environment Committee |
| EIS | Environmental Impact Statement |
| EISPN | EIS Preparation Notice |
| EO | Education and Outreach |
| FLU | Considering Future Land Use |
| HAR | Hawai‘i Administrative Rules |
| HP | Halepōhaku |
| HRS | Hawai‘i Revised Statutes |
| ICM | Independent Construction Monitor |
| IM | Infrastructure and Maintenance |
| IRM | Interpretive Resource Manual |
| KKM | Kahu Kū Mauna |
| LEED | Leadership in Energy and Environmental Design |
| MEU | Monitoring, Evaluation and Updates |
| MEOP | Maunakea Education and Outreach Plan |
| MKMB | Maunakea Management Board |
| MKO | Maunakea Observatories |

| | |
|---------|--|
| MKSR | Mauna Kea Science Reserve |
| MKSS | Mauna Kea Observatory Support Services |
| NAR | Natural Area Reserve |
| NARS | Natural Area Reserve System (DLNR) |
| NOI | Notice of Intent |
| NR | Natural Resources |
| NRMP | Natural Resources Management Plan |
| OAR | Outcome Analysis Report |
| OCCL | Office of Conservation and Coastal Lands (DLNR) |
| OI | Operations and Implementation |
| O&M | Operations and Maintenance |
| OMKM | Office of Mauna Kea Management |
| OMMP | Operations, Monitoring and Maintenance Plan |
| P | Permitting and Enforcement |
| RFI | Radio Frequency Interference |
| SHPD | State Historic Preservation Division (DLNR) |
| SOP | Standard Operating Procedures |
| SR | Site Recycling, Decommissioning, Demolition, and Restoration |
| TCP | Traditional Cultural Property |
| TMT | Thirty Meter Telescope |
| UH | University of Hawai‘i |
| UH Hilo | University of Hawai‘i at Hilo |
| USFWS | U.S. Fish and Wildlife Service |
| VIS | Visitor Information Station |

CHAPTER 1 INTRODUCTION

1.1 PURPOSE OF THIS SUPPLEMENT

The purpose of this document is to supplement the *Mauna Kea Comprehensive Management Plan* (2009 CMP) (Ho‘akea, LLC dba Ku‘iwalu, April 2009). Section 1.2 of this document replaces Section 3.1.1 of the 2009 CMP, and all other parts of this document replace Section 7 of the 2009 CMP. This CMP 2022 Supplement does not propose new activities or land uses.

This supplement, together with the *Outcome Analysis Report* (Center for Maunakea Stewardship, August 2021) (2021 OAR) (Appendix A) and other annual reports submitted by UH to DLNR, is part of what the 2009 CMP describes as a “systematic process for continually improving management policies and practices for resource protection by learning from the outcomes of past and current management activities.”³ Such “adaptive management” allows resource managers and stewards to set aside completed management actions (CHAPTER 2), decide whether to continue a management action as written in 2009, or to adjust course and refine them, based on lessons learned and input from resource experts, Native Hawaiian cultural practitioners, agencies, and others familiar with particular resources.⁴

This supplement also provides clear and transparent measurements of accountability and progress for implementers, primarily through the University of Hawai‘i at Hilo (UH Hilo) Center for Maunakea Stewardship (CMS), and those overseeing and advising UH’s implementation (the Department and Board of Land and Natural Resources (BLNR/DLNR), MKMB’s Environment Committee (EC), the Kahu Kū Mauna Council (KKM), and Maunakea Management Board (MKMB)), and the interested public.

1.2 UPDATE TO LOCATION AND DESCRIPTION OF UH MANAGEMENT AREAS

In April 2009, BLNR approved, subject to conditions, the 2009 CMP, an exhaustive and overarching plan guiding UH’s management of multiple uses and activities in order to protect and conserve natural and cultural resources within the “UH Management Areas.”

This section replaces Section 3.1.1 of the 2009 CMP and updates the definition of “UH Management Areas.” The term “UH Management Areas” will be synonymous with “Mauna Kea lands,” which are defined under Hawai‘i Revised Statutes (HRS) § 304A-1901 as:

... the lands that the University of Hawaii is leasing from the board of land and natural resources, including the Mauna Kea Science Reserve, Hale Pohaku, the connecting roadway corridor between Hale Pohaku and the Mauna Kea Science Reserve, and any other lands on Mauna Kea that the University of Hawaii leases or over which the University of Hawaii acquires control or jurisdiction.

³ The 2009 CMP refers to this approach as “adaptive management.” Adaptive management is defined as a systematic process for continually improving management policies and practices for resource protection by learning from the outcomes of past and current management activities. Adaptive management recognizes that there is a level of uncertainty about the “best” policy or practice for a particular management issue, and therefore requires that each management decision be revisited in the future to determine if it is providing the desired outcome.

⁴ “Resources” include the natural environment and human practices, values, and traditions and their physical manifestations.

The UH Maunakea Lands or UH Management Areas presently consist of two parcels that UH leases and the portion of a third parcel over which UH holds a non-exclusive easement (Figure 1.1):

- Parcel TMK 4-4-015:009 via General Lease S-4191, which expires December 31, 2033. This 11,287.854-acre parcel is called the Mauna Kea Science Reserve (MKSr).⁵
- Parcel TMK 4-4-015:012 via General Lease S-5529, which expires in 2041. This 19.261-acre parcel is known as Halepōhaku.
- Portion of parcel TMK 4-4-015:001 under a non-exclusive roadway easement. This easement, which encompasses 70.798 acres, contains the roadway between the two leased parcels.

Over the life of the UH's tenancy on Maunakea the specific area that falls within UH Maunakea Lands, and thus the UH Management Areas, has and may continue to change.⁶ This CMP is only binding on the UH Maunakea Lands.⁷ If UH Maunakea Lands are modified as the extent of land that UH has control or jurisdiction changes, this CMP will govern only those lands still authorized for use by UH, without the need to amend the CMP.

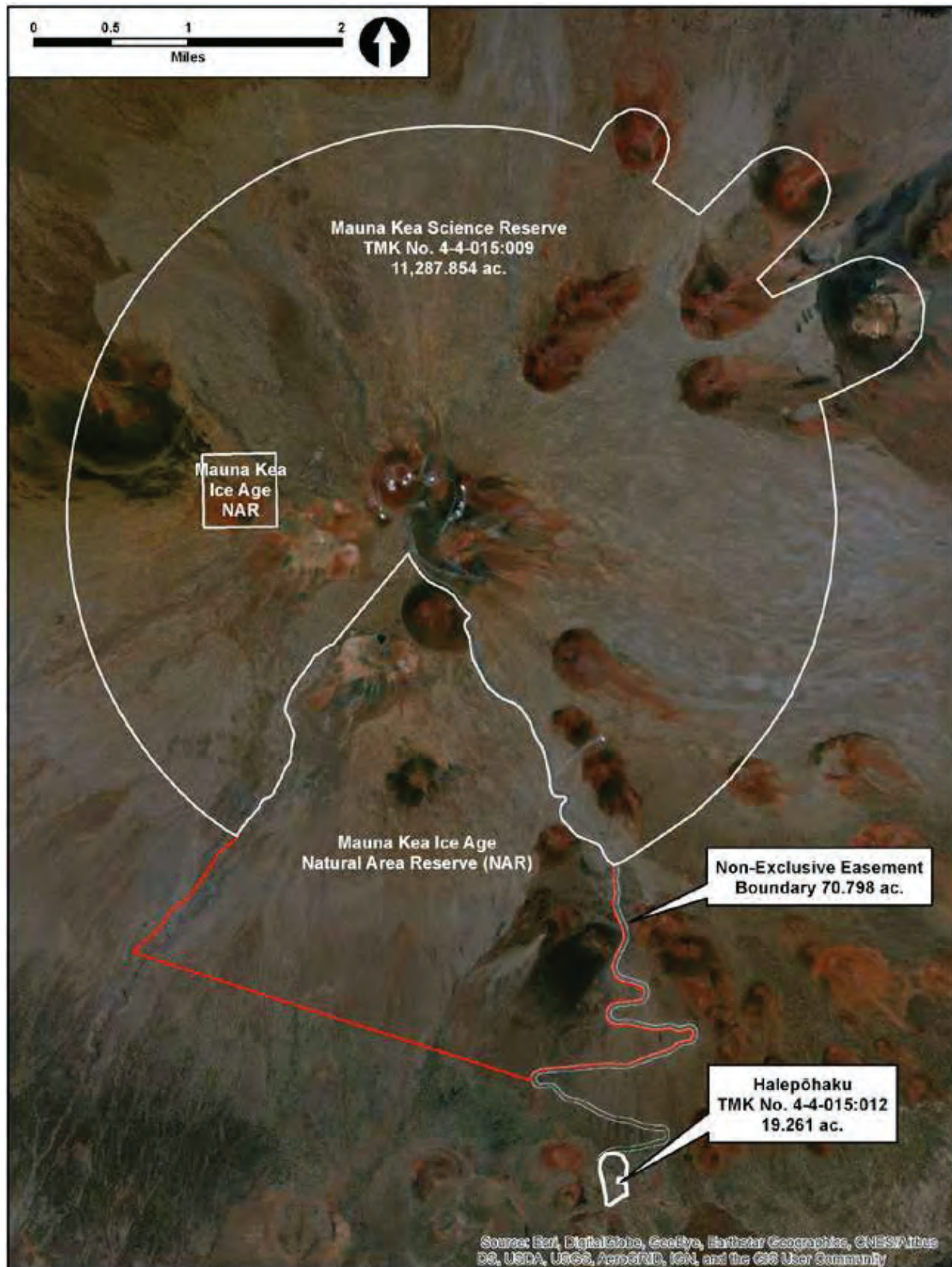
This CMP supplement does not propose expanding or contracting the UH Maunakea Lands.

⁵ Note that approximately 2,033.2 acres were withdrawn from the MKSR by BLNR in 1998 for the Mauna Kea Ice Age Natural Area Reserve.

⁶ For example, in 1998 land was withdrawn from General Lease S-4191, as discussed in footnote 5. UH is working toward and supports a new general lease from BLNR that will include approximately 640 acres for the Mauna Kea Science Reserve, Halepōhaku, and the access road as discussed in Alternative 2 of *Environmental Impact Statement Preparation Notice for Land Authorizations for Long-Term Continuation of Astronomy on Maunakea*, published with the Office of Environmental Quality Control, on February 12, 2018.

⁷ The CMP does not apply to areas not defined as UH Management Areas, although UH has actively sought coordination and consultation with neighboring landowners such as BLNR, DHHL, and others, since species and cultural resources, for example, know no boundaries.

Figure 1.1: UH Maunakea Lands



Source: Planning Solutions, Inc. (PSI)

1.3 OVERVIEW OF COMPREHENSIVE MANAGEMENT PLAN COMPONENTS

This section describes the structure of the remainder of this document, which is divided into 12 subjects with management actions associated with each of them; the 12 subjects are:

1. Cultural resources (CR)
2. Natural resources (NR)
3. Education and outreach activities (EO)
4. Astronomical resources, activities, and uses (AR)
5. Activities and uses (ACT)
6. Permitting and enforcement (P)
7. Infrastructure and maintenance (IM)
8. Construction guidelines (C)
9. Site recycling, decommissioning, demolition, and restoration (SR)
10. Considering future land use (FLU)
11. Operations and implementation (OI)
12. Monitoring, evaluation, and updates (MEU)

Each of the 12 subjects has its own chapter in this document (Chapters CHAPTER 3 through CHAPTER 14) with the following subsections:

- Introduction, which provides a brief background and identifies the section of the 2021 OAR (Appendix A) where information concerning the current status of the topic can be found.
- Desired Outcome, which summarizes the goal(s) associated with the subject. The desired outcomes have not substantially changed; UH's remains committed to achieving the desired outcomes approved in 2009.
- Need, which provides a brief high-level discussion of why the subject and its management actions are needed to advance proper management of the UH Management Areas.
- Management Actions, which provides details regarding each of the subject's ongoing management actions. This document updates the CMP management actions, where warranted, per management action MEU-2 to better realize the desired outcomes using adaptive management techniques that considered lessons learned, information collected, and input received since the CMP was adopted.⁸ In some cases the management actions in this supplement remain nearly identical to their original 2009 version. In other cases, they have been substantially adapted. At a minimum, the management actions have been adapted to be consistent with the Maunakea Administrative Rules, which did not exist in 2009; the *Master Plan for the University of Hawai'i Maunakea Lands, E Ō I Ka Leo (Listen to the Voice)* (Planning Solutions, Inc., January 2022) (2022 Master Plan), which is substantially

⁸ As discussed in Chapter 2, fourteen (14) of the 103 management actions in the original 2009 CMP have been completed and are therefore not discussed outside of Chapter 2 in this document. That is why some management action numbers are missing. For example, management action CR-5 through CR-9 are complete; therefore, the reader will find management actions CR-1 through CR-4 and then CR-10 in this document.

different than the 2000 Master Plan; and UH's Maunakea governance structure as of 2021. In all cases, this supplement provides the complete set of management actions.

1.4 BACKGROUND AND CONTEXT

1.4.1 UH PLANS, LAND AUTHORIZATIONS, AND RULES APPLICABLE TO UH MANAGEMENT

The CMP is an integrated planning tool intended to enable wise resource management. It provides the framework for managing multiple existing and future activities, such as recreational and commercial activities, scientific research (e.g., astronomy), and for protecting Maunakea's unique cultural and natural resources. Together, UH's land authorizations, the CMP, and the Maunakea Administrative Rules provide both the guidance and the authority that UH needs to manage the UH Management Areas.

The only active plans relevant to UH decision-making regarding the UH Maunakea Lands are: (i) the CMP, which is periodically updated/supplemented and approved by the BOR and the BLNR; and (ii) the 2022 Master Plan, which was approved and adopted by UH. The CMP and the 2022 Master Plan are consistent and complement one another and are intended to be implemented together. The CMP addresses management of activities and resources. The 2022 Master Plan addresses the planning, siting, and design of new facilities and significant material changes to existing facilities.

1.4.2 MAUNAKEA ADMINISTRATIVE RULES

The Maunakea Administrative Rules¹⁰ were adopted by the Board of Regents on November 6, 2019, and approved by the Governor on January 13, 2020, after the 2009 CMP and 2000 Master Plan. The adoption and approval of the Maunakea Administrative Rules completed CMP management action ACT-11 and addressed significant elements of many other management actions; the rules are an essential tool for managing and protecting resources.

The purpose of the Maunakea Administrative Rules as stated in HAR § 20-26-1, is as follows:

“to provide for the proper use, management, and protection of cultural, natural, and scientific resources of the UH management areas; to promote public safety and welfare by regulating public and commercial activity within the UH management areas; to ensure safe and appropriate access to the UH management areas for the public; and to foster co-management with the department of land and natural resources in UH management areas.”

Rangers are authorized to issue citations to enforce the Maunakea Administrative Rules under HAR § 20-26-74 (ACT-3, Section 7.4.3). To protect Maunakea's resources, civil violations under the Maunakea Administrative Rules include littering; parking in undesignated areas; and removing, injuring, or disturbing resources. The Maunakea Administrative Rules address public and commercial activities only within the UH Management Areas.

Under the Maunakea Administrative Rules, four types of permits are issued or reviewed by CMS: research, special use, commercial tour activity, and commercial film and recordings. Special use permits may allow activities otherwise prohibited under the rules. The permitting process allows for the consideration of a proposed activity's:

¹⁰ <https://www.hawaii.edu/offices/bor/adminrules/chapter26.pdf>.

- Compatibility with the functions and purpose of the UH Management Areas, consistency with approved management plans;
- Potential effect on the surrounding resources, existing facilities, and the public's activities within the UH Management Areas;
- Compatibility with existing approved uses; and
- Compatibility with scheduled or ongoing construction, repairs, or maintenance activities.

The rules do not regulate Native Hawaiian traditional and customary rights. The Maunakea Administrative Rules explicitly acknowledge that “Native Hawaiian traditional and customary rights as recognized and protected under article XII, section 7, of the Hawai‘i State Constitution shall not be abridged.” Article XII, section 7, of the Hawai‘i State Constitution provides that “The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua`a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights.”

1.4.3 THE CMP MANAGEMENT ACTIONS UPDATE/SUPPLEMENT PROCESS

The authors of the 2009 CMP used the best information available at the time that it was adopted. At the same time, they recognized that the resource information would improve over time, new management structures might be introduced, and public opinions would continue to evolve as the community engagement effort that is part of the CMP (see management actions EO-7, EO-8, and others) was implemented. With these considerations in mind, the CMP noted that community cooperation in the long-term management of Maunakea's resources is essential if all its desired outcomes are to be achieved and the trust between the community and UH is to be rebuilt.

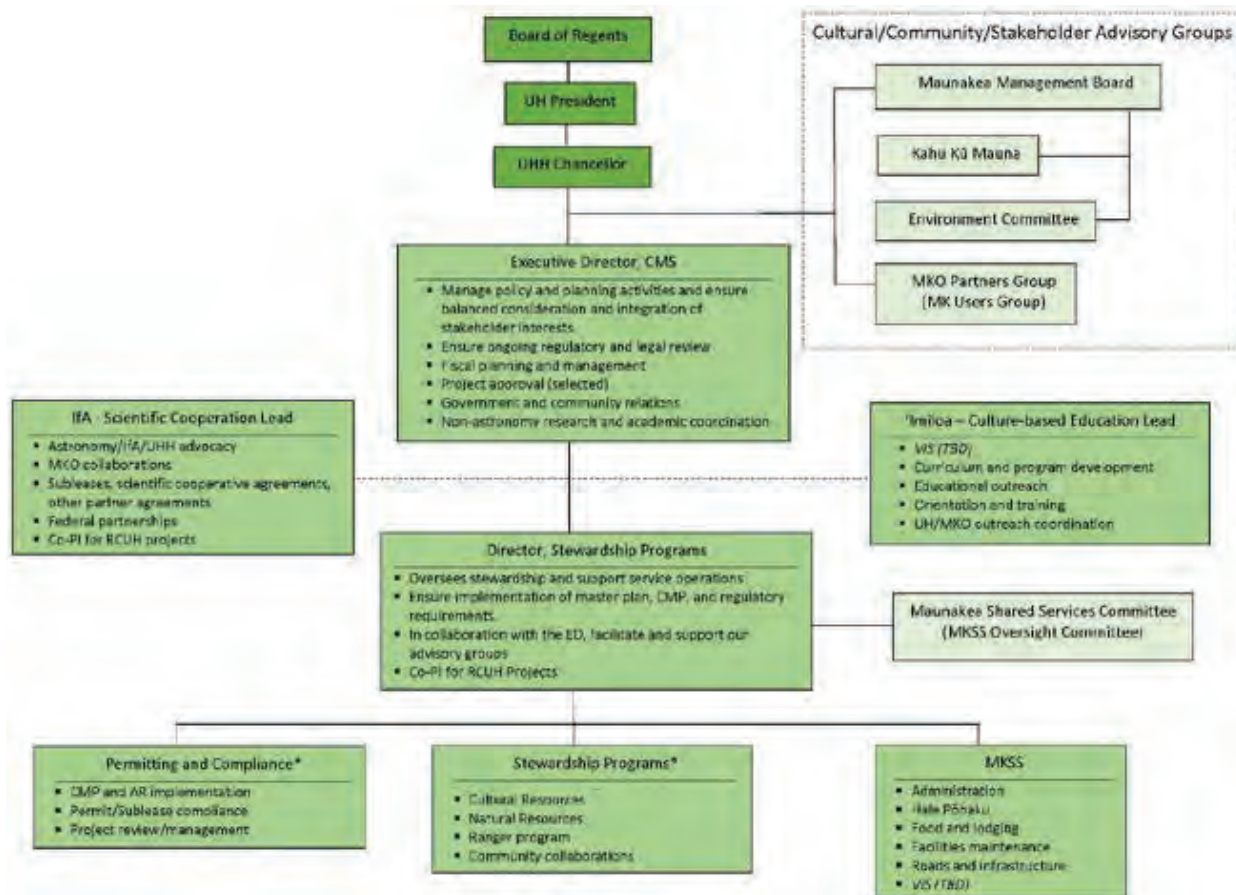
In accordance with the provisions of the CMP, CMS, which has replaced the Office of Mauna Kea Management (OMKM) as the entity responsible for overseeing the UH Maunakea Lands, prepared a *Draft Outcome Analysis Report* (Center for Maunakea Stewardship, April 2021) describing the progress that UH had made in implementing the management actions contained in the CMP and outlining the adaptations, adjustments, and changes that it believed should be made to those measures in the coming years. It circulated the draft OAR to agencies and advisors participating in the review process at the end of April 2021, and followed up over the following weeks with video-conference meetings with those agencies and advisors. It then used the written and oral feedback that it received to revise and finalize the OAR. The 2021 OAR (Center for Maunakea Stewardship, August 2021) (Appendix A), which reflects the feedback that was received from agencies and advisors participating in the review process, forms the basis of the updates and adaptations of the management actions in this document.

1.4.4 UH MAUNAKEA GOVERNANCE STRUCTURE AND ROLES IN CMP IMPLEMENTATION

The CMP management actions will be implemented through the governance structure approved via a motion by the BOR. The BOR delegated responsibility for the governance and management of UH Maunakea Lands to UH Hilo, which is advised by the groups listed below. UH Hilo has, in turn, created the Center for Maunakea Stewardship (CMS) to administer the lands. This governance structure is established through BOR motions and is outside the scope of the CMP management actions. The governance structure at the time this plan supplement was adopted is

illustrated in Figure 1.2. The structure may be modified from time to time without requiring the CMP to be amended.

Figure 1.2: CMS Governance Structure, Established in 2020



Notes: * Shown here for descriptive purposes. Organization of these functions to be finalized by Director of Stewardship Programs. The structure may be modified from time to time without triggering a need to amend this plan.

Source: CMS

The “Cultural/Community/Stakeholder Advisory Groups” are important aspects of UH’s governance and they fill important advisory roles on a regular basis as UH implements the CMP. These groups are:

- Maunakea Management Board (MKMB) provides the community with a sustained direct voice for the management of Maunakea. The Board is composed of seven members from the community nominated by the University of Hawai‘i Hilo (UH Hilo) Chancellor and approved by the UH Board of Regents. The volunteer members represent a cross-section of the community and serve as the community’s voice, providing input on operations and activities, developing policies, and reviewing and providing recommendations for land uses planned for Maunakea.
- Kahu Kū Mauna (Guardians of the Mountain) Council (KKM) is a community-based volunteer council whose members are from the Native Hawaiian community. KKM advises the CMS, MKMB, and the UH Hilo Chancellor on Hawaiian cultural matters affecting the UH Management Areas. They review proposed projects and give their input to MKMB, and a KKM member participates in MKMB discussions during its public meetings.

- Environmental Committee (EC) advises MKMB, CMS, and the UH Hilo Chancellor on environmental issues, protection and enhancement of the natural environment, and resource management practices to advance the stewardship of Maunakea’s natural resources. The EC members serve as subject matter experts on environmental matters to support evidence-based, holistically evaluated planning, project management, and policy development by UH.
- Maunakea Observatories (MKO) advises CMS, Institute for Astronomy, ‘Imiloa and the UH Hilo Chancellor on plans, policies, programs and operational issues of mutual interest.

1.4.5 ISSUES AND CONCERNS BEYOND THE SCOPE OF THE CMP

Through the extensive community outreach that took place during the review of the draft 2022 Master Plan and other efforts, it remains clear that the community has several concerns related to past and future activities on Maunakea and specifically within the UH Management Areas that went beyond the scope of the 2022 Master Plan and also go beyond the scope of the CMP 2022 Supplement. Some of these issues and concerns are listed below. Policy makers are urged to consider them in their broader decision making related to Maunakea.

- The existing general lease between UH and DLNR and/or the CDUP for the TMT project (HA-3568) should, or should not, be terminated.
- A new land authorization that would allow for astronomy to continue on Maunakea beyond 2033 should, or should not, be awarded in the future.
- UH is, or is not, the appropriate entity to manage the cultural landscape and natural resources in the summit region or access to this sensitive area.
- The UH Maunakea Lands were “stolen” from the Hawaiian Kingdom.
- Whether or not the annexation of Hawai‘i by the United States was legal.
- The desire by some for Hawaiian sovereignty.
- Whether or not the state’s activities, uses, and management of Maunakea accord with the United Nations Declaration on the Rights of Indigenous Peoples.

CHAPTER 2 COMPLETED MANAGEMENT ACTIONS

As documented in the 2021 OAR, UH has completed 14 of the management actions identified in the 2009 CMP.¹¹ Those actions are listed in Table 2.1 below. To learn how UH completed these management actions please see the section in the 2021 OAR (Appendix A) stated in the right column of the table.

Table 2.1 Completed Management Actions

| Mgmt. Action | Description | For Completion Details See OAR Section |
|--|---|---|
| CR-5 | Develop and adopt guidelines for the culturally appropriate placement and removal of offerings. | 2.1.3.5 |
| CR-6 | Develop and adopt guidelines for the visitation and use of ancient shrines. | 2.1.3.6 |
| CR-7 | Kahu Kū Mauna (KKM) shall take the lead in determining the appropriateness of constructing new Hawaiian cultural features. | 2.1.3.7 |
| CR-8 | Develop and adopt a management guideline for the UH Management Areas on the scattering of cremated human remains. | 2.1.3.8 |
| CR-9 | A management guideline for the cultural appropriateness of building ahu or “stacking of rocks” will need to be developed by KKM who may consider similar policies adopted by Hawai’i Volcanoes National Park. | 2.1.3.9 |
| CR-11 | Complete an archaeological survey of the portions of the Summit Access Road corridor that are under UH management. | 2.1.3.11 |
| CR-12 | Consult with KKM about establishing buffers (preservation zones) around known historic sites near facilities, to protect them from potential future development. | 2.1.3.12 |
| NR-15 | Conduct baseline inventories of high-priority resources, as outlined in an inventory, monitoring, and research plan. | 2.2 |
| ACT-11 | Seek statutory authority for the University to regulate commercial activities in the UH Management Areas. | 3.4.2.11 |
| P-3 | Obtain statutory rule-making authority from the legislature, authorizing the University of Hawai’i to adopt Administrative Rules pursuant to Chapter 91 to implement and enforce the management actions. | 3.5.2.3 |
| P-6 | Obtain legal authority for establishing, and then establish, a law enforcement presence on the mountain that can enforce rules for the UH Management Areas. | 2.5.2.6 |
| FLU-2 | Develop a map with land use zones in the Astronomy Precinct based on updated inventories of cultural and natural resources, to delineate areas where future land use will not be allowed and areas where future land use will be allowed but will require compliance with prerequisite studies or analysis prior to approval of Conservation District Use Permit. | 3.9.2.2 |
| OI-1 | Maintain OMKM, MKMB, and KKM in current roles, with OMKM providing local management of the UH Management Areas, and MKSS providing operational and maintenance services. | 3.10.2.1 |
| OI-2 | Develop training plan for staff and volunteers. | 3.10.2.2 |
| Source: Tables 4.1 through 4.25 in 2021 OAR. | | |

Since these 14 management actions (Table 2.1) are completed, they have not been modified from their 2009 form, are not discussed further in this document, and will not be discussed in future annual reports or future updates. This accounts for the management action numbering gaps, since

¹¹ The 2021 OAR indicated that 15 management actions were complete. UH decided during the preparation of this document that management action CR-13 was not complete because the Burial Treatment Plan is still being implemented and therefore ongoing. Thus, there are now 14 management actions considered complete.

this CMP 2022 Supplement retains the 2009 CMP assigned management action numbers to minimize confusion about the origin of the ongoing management actions.

CHAPTER 3 CULTURAL LANDSCAPE

3.1 INTRODUCTION

Section 7.1.1 of the 2009 CMP provided information and formulated management actions relevant to the protection, preservation, and enhancement of the cultural resources of the UH Management Areas. In this supplement, the term “Native Hawaiian Cultural Resources” has been replaced with “Cultural Landscape.” As used in the CMP, the cultural landscape is composed of physical elements which manifest with culture and human use through time. The cultural landscape includes akua, cultural practices and beliefs, resource extraction, traditional trail systems, navigation, and historic properties (e.g., archaeological sites). Cultural practices are (i) Native Hawaiian customary and traditional practices, and (ii) contemporary practices. Information concerning the current status of the cultural landscape can be found in Section 2.1 of the 2021 OAR (Appendix A).

3.2 DESIRED OUTCOME

The “desired outcome” with respect to the cultural landscape is to:

Increase understanding and appreciation of Native Hawaiian history and cultural practices related to Maunakea to ensure that these practices are protected and respected. Identify, document the condition of, and protect cultural resources and historic properties in the UH Management Areas.¹²

3.3 NEED

Given the significance of the cultural landscape as a whole, there is a need to continue the implementation of the CMP’s management actions related to the cultural landscape to avoid and/or minimize disturbance and potential impacts to the cultural landscape. The CMP strategies reflect a series of general guidelines including:

- Acknowledging that Mauna Kea is a *wahi pana* (legendary, storied place) and is within the *wao akua* (the realm of the gods) and for some it is sacred.
- Recognizing the need to continue and reinvigorate outreach to the Native Hawaiian community, including customary and traditional practitioners and families with lineal and historic connections to Maunakea, when formulating plans and guidelines.
- Recognizing that Native Hawaiian customary and traditional practices may evolve over time and that management needs may also change.
- Ensuring a balanced approach between Native Hawaiian customary and traditional practices related to the cultural landscape and the need to protect natural resources and historic properties.¹³

¹² As used in this report, “cultural practices” means: (1) Native Hawaiian customary and traditional practices protected by the State of Hawai‘i Constitution and (2) contemporary practices.

¹³ The 2009 CMP did, and this document confirms, that pursuant to the legal requirements under the Hawai‘i Supreme Court’s ruling in *Ka Pa‘akai*, access to UH Management Areas for Native Hawaiian traditional and customary practices will not be restricted. To the extent that public safety and resources are affected, activities may be allowed under the Maunakea Administrative Rules with reasonable restrictions to ensure public safety and resources protection. The 2009 CMP lists the

- Disseminating culturally sensitive and appropriate educational information to visitors and others who are not familiar with this cultural landscape or who do not engage in customary and traditional Native Hawaiian practices to protect the cultural landscape effectively and efficiently.
- Complying with and enforcing applicable rules and regulations to protect the cultural landscape.
- Focusing efforts to address issues identified in the *Independent Evaluation of the Implementation of the Mauna Kea Comprehensive Management Plan* (Kuiwalu, December 2020), specifically (i) materials and training programs to increase understand of Native Hawaiian history and cultural practices related to Maunakea; and (ii) engagement with the Native Hawaiian community.
- Embracing UH's commitment¹⁴ to collaboratively build a global model of harmonious and inspirational stewardship that is befitting of Maunakea that is informed by and integrates indigenous and other management principles, including the kānāwai principles.

3.4 MANAGEMENT ACTIONS

As discussed in detail in Section 2.1 of the 2021 OAR and summarized in CHAPTER 2 of this document, half of the 14 CMP management actions related to cultural landscape have been completed. The seven (7) management actions that are ongoing are listed in Table 3.1 and detailed in Sections 3.4.1 through 3.4.7.

following as examples of the access that it expects will continue: (i) access for traditional and customary practices, including the gathering of cultural resources; (ii) access for families to visit *na iwi kupuna* (the bones of their ancestors); (iii) access to scatter 'ohana ashes; (iv) access through the trails located within the UH Management Areas for subsistence gathering and hunting; (v) access for families to continue to bury their 'ohana piko; (vi) access for traditional and customary practices, including religious and spiritual observances, pilgrimage, offerings, and prayers; and access for families to gather water from Lake Wai'au for religious and spiritual purposes. The CMP also outlines an approach to be used in the event of disputes or determination of appropriateness of traditional and customary practices, including cultural, historical, and natural resources.

¹⁴ UH Board of Regents Resolution "Affirming Commitment to the Collaborative Stewardship of Maunakea's Cultural, Natural, Educational and Scientific Resources" adopted August 24, 2017.

Table 3.1 Ongoing Cultural Landscape Management Actions

| Mgmt. Action | Description | Discussion |
|---|--|------------|
| Management | | |
| CR-1 | UH will engage with families with lineal and cultural connections to Maunakea, Native Hawaiian customary and traditional practitioners, and other Native Hawaiian groups, including Kahu Kū Mauna Council (KKM), toward the development and maintenance of appropriate guidance regarding cultural issues. | 3.4.1 |
| CR-2 | Support application for designation of the summit region of Maunakea as a Traditional Cultural Property, under the National Historic Preservation Act of 1966, Public Law 89-665, as amended. | 3.4.2 |
| CR-3 | Conduct educational efforts to generate public awareness about the importance of preserving the cultural landscape. | 3.4.3 |
| Native Hawaiian Cultural practices and knowledge | | |
| CR-4 | Collect information on customary and traditional Native Hawaiian cultural practices, contemporary cultural practices, and traditional Native Hawaiian knowledge. | 3.4.4 |
| Historic properties | | |
| CR-10 | Continue to implement the <i>Long-Term Historic Property Monitoring Plan for the University of Hawai‘i Management Areas on Mauna Kea, Ka‘ohe Ahupua‘a, Hāmākua District, Hawai‘i Island, State of Hawai‘i</i> (Pacific Consulting Services, Inc., April 2014) and seek SHPD approval of amendments. | 3.4.5 |
| CR-13 | Continue to implement the <i>Burial Treatment Plan for Burial Sites in the Mauna Kea Science Reserve and the Mauna Kea Access Road Corridor, Ka‘ohe Ahupua‘a, Hāmākua District, Island of Hawai‘i</i> (Pacific Consulting Services, Inc., July 2014). | 3.4.6 |
| CR-14 | Continue to immediately report any disturbance of a historic shrine or burial site to DOCARE, KKM, and SHPD. | 3.4.7 |
| Note: | The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | |
| Source: | Adapted from the 2021 OAR, Table 2.5. | |

3.4.1 CR-1: ENGAGE WITH CULTURAL COMMUNITY AND DEVELOP AND MAINTAIN APPROPRIATE GUIDANCE REGARDING CULTURAL ISSUES

UH continues to take into account the Hawai‘i Supreme Court’s analytical framework to ensure that traditional and customary Native Hawaiian rights are preserved and protected. This framework has its foundation in *Ka Pa‘akai*.¹⁵ This includes at a minimum addressing: “(1) the identity and scope of ‘valued cultural, historical, or natural resources’ in the petition area, including the extent to which traditional and customary native Hawaiian rights are exercised in the petition area; (2) the extent to which those resources – including traditional and customary native Hawaiian rights – will be affected or impaired by the proposed action; and (3) the feasible action, if any, to be taken by the [agency] to reasonably protect native Hawaiian rights if they are found to exist.”

To achieve this, UH will continue to work cooperatively with KKM, families with lineal and cultural connections to Maunakea, Native Hawaiian customary and traditional practitioners, the Office of Hawaiian Affairs (OHA), and other Native Hawaiian groups. In carrying out this work:

- CMS will increase the frequency with which it reaches out to representatives of the types of groups listed above as part of its interaction and relationship building with the community. CMS anticipates that the outreach will include:

¹⁵ *Ka Pa‘akai O Ka ‘Aina v. Land Use Commission*, 94 Hawai‘i 31 (2000) (*Ka Pa‘akai*).

- Maintaining a CR-1 mailing list (with a preference for email communication) that includes individuals and families that self-identify as Native Hawaiian, including those that self-identify as having lineal and cultural connections to Maunakea and/or self-identify as customary and traditional practitioners, OHA, and other Native Hawaiian groups. The CR-1 mailing list will be updated regularly.
- Providing regular updates (minimum once a year) to those on the CR-1 mailing list. Timely updates will be sent so that those on the CR-1 mailing list are informed about and can provide input on the following; thus, updates will be sent at least 6 days prior to these items appearing on public MKMB agendas:
 - Land use proposals¹⁶ (during Phase 2, 3 and 4 proposal reviews);
 - Proposed procedures and guidelines that are being developed as part of this management action;
 - Updates to plans;
 - Annual Archaeological Monitoring Reports (CR-10, Section 3.4.5); and
 - Other actions being considered or reports prepared by/for UH and CMS that may be of interest or concern to those on the CR-1 mailing list.

By this process, Native Hawaiians and organizations that represent Native Hawaiians will be informed and have opportunities to provide input early in the process, well before proposed uses, plans, and guidelines are finalized and adopted by UH. The materials that will be used in support of this outreach will include copies of draft plans and guidelines and detailed written information regarding opportunities to review and comment on draft proposals and plans.

- CMS will provide regular updates to the individuals that the Hawai‘i Island Burial Council recognizes as lineal and cultural descendants of Ka‘ohe Ahupua‘a. In all cases the updates will be provided at least once each calendar year.
- CMS will make efforts to have KKM’s seven members represent a broad spectrum of perspectives on Maunakea’s cultural landscape and Native Hawaiian issues.
- Based on the results of its outreach efforts and input from the Native Hawaiian community, CMS will, if appropriate, develop new and/or modify existing management guidelines regarding cultural issues and it will continue to consider, and potentially amend or modify, adopted management guidelines regarding cultural issues, including those associated with completed CMP management actions CR-5, CR-6, CR-7 (which also addresses CR-9), CR-8, and CR-12 (see <https://hilo.hawaii.edu/maunakea/culture/management>). This will be done in a manner that is consistent with the CMP, 2022 Master Plan, and Maunakea Administrative Rules.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The title of this management action previously stated “Kahu Kū Mauna shall...” KKM is an advisory body, not an action entity; therefore, this management action has been adapted to specify that “UH

¹⁶ Land use is defined in HAR § 13-5-2, as (1) the placement or erection of any solid material on land if that material remains on the land more than fourteen days, or which causes a permanent change in the land area on which it occurs; (2) the grading, removing, harvesting, dredging, mining or extraction of any material or natural resource on land; (3) the subdivision of land; or (4) the construction, reconstruction, demolition, or alteration of any structure, building, or facility on land.

will....” Based on community input, this management action has been adapted to place greater emphasis on outreach to the Native Hawaiian community and specify that such outreach will not be limited to establishing guidelines related to appropriate behavior within the UH Management Areas, but be expansive and seek input on all proposals, plans, and actions early and often. Other aspects of the management action are retained, such as developing policy regarding cultural issues.

3.4.2 CR-2: SUPPORT APPLICATION FOR DESIGNATION OF SUMMIT AS TCP

UH will share its reports and studies related to the cultural landscape within the summit region of Maunakea with others and not oppose an application submitted by any entity that requests portions of the summit region of Maunakea be designated a Traditional Cultural Property (TCP), under the National Historic Preservation Act of 1966, Public Law 89-665, as amended.

Kūkahau‘ula has been assigned State Inventory of Historic Places (SIHP) site number 50-10-23-21439; however, UH is not aware of an application being submitted for its or any other portion of Maunakea to the National Register of Historic Places to be listed as a TCP. Should an application be prepared to designate the portions of the Maunakea summit region similar to those shaded yellow in Figure 3.1, UH’s reports and studies may be used to inform it and UH would not oppose it.

Figure 3.1: Potential Traditional Cultural Properties in the UH Management Areas

Source: Planning Solutions, Inc.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The management action, which in 2009 was a single sentence, has been expanded to clarify what “support” means (e.g., sharing its reports if an entity nominates portions of the summit region of Maunakea to be designated a TCP).

3.4.3 CR-3: CONDUCT EDUCATIONAL EFFORT TO RAISE PUBLIC AWARENESS OF IMPORTANCE OF PRESERVING THE CULTURAL LANDSCAPE

UH’s ongoing management efforts related to this topic have two interrelated, but distinct, thrusts. The first, which is focused on raising the level of public awareness of the importance of preserving the cultural landscape on Maunakea, consists of the combined effort by CMS and ‘Imiloa that are discussed elsewhere in this document (see, for example, Section 5.4.3.1). The second, which is oriented toward limiting threats to the cultural landscape through management of activities and uses, is discussed in Section 7.4. To achieve this, UH and CMS will:

- Ensure CMS' staff members who are knowledgeable about the cultural landscape participate in the implementation of EO-# coded management actions (Sections 5.4.1, 5.4.2, and 5.4.3), which focus on education and outreach. The education and outreach programs will be managed so that materials are regularly updated by personnel knowledgeable about the cultural landscape. This may include:
 - Adding cultural landscape content to the educational materials prepared as part of EO-# coded management actions (Sections 5.4.1, 5.4.2, and 5.4.3) that, among other things, affirms Maunakea as a wahi pana and wao akua.
 - Compile cultural, archaeological, and historic background materials, maps, chronology, and photographs to aid staff presentation or interactions with public.
- Ensure CMS' cultural resource specialists participate in the implementation of ACT-# coded management actions focused on managing activities and uses that are discussed in detail in Section 7.4.
- Partner with other cultural-based entities within UH Hilo and the community to increase Native Hawaiian participation in programs like Maunakea Scholars (www.maunakeascholars.org) and identify opportunities and create programs that build a cultural component to the Multidisciplinary Field Station concept at Halepōhaku.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The second thrust of limiting threats to the landscape was added to this management action, related to ACT-# coded management actions, to make it clear that cultural resources shall be considered during the management of activities and uses, like the natural resources management action NR-1. This was done because, during implementation of the CMP, UH recognized that the CR and NR management actions did not, but should, have similar scopes.

3.4.4 CR-4: COLLECT INFORMATION ON TRADITIONAL, CUSTOMARY, AND CONTEMPORARY CULTURAL PRACTICES AND KNOWLEDGE

In accordance with management action CR-4, UH has collected and is continuing to collect information on traditional, customary, and contemporary cultural practices on Maunakea. One of UH's core value, *'ike Hawai'i; nohona Hawai'i* (traditional knowledge; traditional practices), involves integrating traditional knowledge and practice into its stewardship to strengthen the protection and conservation of Maunakea's resources. CMS will partner with educational institutions such as the UH Hilo and Hawai'i Community College to establish an oral history program that is devoted to memorializing the traditional and customary practices and knowledge associated with Maunakea.

In addition, Native Hawaiian families or communities that self-identify as having a cultural connection to Maunakea have been and will continue to be invited to work with CMS (CR-1, Section 3.4.1). While there are several reports on Native Hawaiian customary and traditional practices and cultural sites on Maunakea, identifying these practices and sites is an ongoing process to ensure those practices are protected and respected.

Examples of the ongoing efforts related to the collection of information on traditional, customary, and contemporary practices that CMS expects to undertake include the following:

- Conduct and update oral histories and ethnographic studies gathered from those knowledgeable of cultural practices on Maunakea.
- Work with ‘Imiloa to capture and incorporate information on cultural practices in curriculum and education/outreach program development.
- Hold events, similar to the Maunakea Speakers Series, that focus on cultural topics that can serve as convening events for those knowledgeable of cultural practices on Maunakea.
- Work with UH Hilo entities, including those associated with Hawaiian language and Hawaiian studies, to develop programs that delve more deeply into Maunakea’s cultural connections and take advantage of UH’s objective to utilize the facilities at Halepōhaku as a Multidisciplinary Field Station.

Working with its advisory groups (e.g., KKM, EC, and MKMB), UH is and will continue to integrate the accumulated Native Hawaiian knowledge with other scientific findings and use both to inform its approaches to implementing the CMP. This may inform approaches to any of the CMP management actions, not just the CR management actions. For example, programs to implement education management actions (EO-#, Section 5.4.3) and the access management action (ACT-1, Section 7.4.1) will continue to incorporate Hawaiian knowledge and methods.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Traditional knowledge was added to the management action to recognize that ‘ike Hawai‘i can inform UH’s broad stewardship of Maunakea. Community events were added to this management action because UH has learned that conversations at these events often provide insights into cultural practices.

3.4.5 CR-10: IMPLEMENT THE HISTORIC PROPERTY MONITORING PLAN

UH will continue to implement its SHPD-approved *Long-Term Historic Property Monitoring Plan* (Pacific Consulting Services, Inc., April 2014). This includes: (i) an annual assessment of historic properties in relatively close proximity to land uses (e.g., near astronomy facilities and alongside the Mauna Kea Access Road); (ii) assessment of the more remote sites within the MKSR on a three- and five-year rotational basis; and (iii) submission of annual reports regarding the status of historic properties to SHPD after seeking the advice of the KKM on management action recommendations.

As discussed in Section 2.1.4.1 of the 2021 OAR, experience gained during years of intensive historic properties monitoring and reporting, has led CMS to conclude that it is appropriate to adjust the monitoring in a way that maintains effective stewardship of cultural resources while at the same time better utilizing the finite financial resources that are available for this purpose. CMS hopes to revise the monitoring plan so that it focuses on the resources that are demonstrably the most vulnerable, while limiting monitoring of the least vulnerable resources to *ad hoc* surveillance. Specifically, it will likely be asking SHPD for permission to revise the monitoring program as follows:

- Reassess the current annual assessment program for sites on the 1-year list (including sites on Pu‘umākanaka [as per the Burial Treatment Plan (BTP), see CR-13], and all sites near astronomy facilities and the road corridor). Remove sites from the 1-year list (and place

them on 3-year or 5-year assessment lists) that are farther away from facilities and roads and have shown no changes throughout the 10 years of monitoring.

- Reduce the number of sites requiring visits during the 3-year and 5-year assessments (possibly excluding shrine sites with no upright/erect stones or surface lithic scatters).
- Conduct a full assessment once every ten years rather than once every five years (as is now the case).
- Update the list of historic properties sites to reflect new sites found, if any, during the monitoring, and add new information about historic properties, if any, that may have been identified since the baseline.
- Link ad hoc visits to historic resources (not assessed annually) to work conducted as part of other projects or studies (e.g., biological and geological surveys).
- Make the report submitted to SHPD labeled as neither a “draft” or “final.” Instead title the reports as Year Historic Property Monitoring Report, UH Maunakea Lands (e.g., “2022 Historic Property Monitoring Report, UH Maunakea Lands”). The report will only be modified to address SHPD comments in the event that comments are received.

Going forward, CMS will review the recommendations in the annual historic properties monitoring reports and those found to be appropriate for implementation will be incorporated into the ongoing historic property monitoring program, historic property mitigation program, or other CMP program as appropriate for implementation in subsequent years.

CMS will also seek to use budget made available through the amendment of the monitoring plan to implement the data recovery efforts that are outlined below. These data recovery efforts were recommended in past annual historic property monitoring reports, which indicate data recovery at several historic properties is appropriate before the sites’ integrity diminishes to a point where they are no longer considered significant. The types of data recovery efforts deemed appropriate vary from archaeological excavation to archaeological mapping. Specific “still-to-be-acted-upon” recommendations from the archaeological monitoring reports include the following:

- SIHP No. 50-10-23-16204. With advice from KKM and in coordination with SHPD, develop a data recovery plan as a proactive response to collect baseline data before the likely loss of data due to continued alteration at the site. The plan should include: (i) a subsurface testing strategy for features with likely subsurface deposits (i.e., the enclosures and lithic scatters) and (ii) detailed mapping of the site (potentially using technologies such as LIDAR and 3-dimensional scanning) that not only records archaeological features, but non-feature-related rocks within the site complex.
- SIHP No. 50-10-23-25766. Develop a data recovery plan, in coordination with SHPD and KKM, to determine whether a subsurface component to the site exists and whether that deposit retains any significance; and upon completion of the subsurface excavations, re-evaluate the significance of Site 25766.
- SIHP Nos. 50-10-23-9074 and -9075. Consult with Architectural historian or engineer to determine the proper level of conservation for Sites 9074 and 9075.

- SIHP No. 50-10-23-25770. With advice from KKM and in coordination with SHPD, develop a plan to append site map for Site 25770 and track possible movement of surface artifacts.
- SIHP No. 50-10-23-10314. With advice from KKM and in coordination with SHPD, develop a data recovery plan to collect baseline data for Site 10314. The plan should include a research design, planned analyses, as well as a review of the site's known history of research; upon completion of the subsurface excavations, re-evaluate the significance of Site 10314.
- SIHP Nos. 50-10-23-18683, 25768, 25769, 21214, 21452, 25807, and newly recorded lithic scatters. With advice from KKM and in coordination with SHPD, develop a plan to map sites and track possible movement of surface artifacts.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Over many years of implementing the *Long-Term Historic Property Monitoring Plan*, UH has learned that (i) monitoring the remote historic properties subjects staff and consultants to unnecessary safety risks, (ii) monitoring the remote historic sites is costly, and (iii) the remote historic sites are not being adversely impacted by ongoing activities and uses in the UH Management Areas. Another realization has been that greater efforts are necessary to preserve and document historic sites near activities, facilities, and uses in the UH Management Areas that are being impacted directly or indirectly by those activities, facilities and uses. Therefore, UH proposes to amend the monitoring plan and direct savings, if any, to recommended preservation and documentation tasks.

3.4.6 CR-13: IMPLEMENT THE BURIAL TREATMENT PLAN

UH will continue to implement the SHPD-approved *Burial Treatment Plan* (BTP) (Pacific Consulting Services, Inc., July 2014). It is important to note that the BTP concerns historic burials. The modern scattering or leaving of ashes within the UH Management Areas is not covered in the BTP; guidance regarding the scattering or leaving of ashes can be found at <https://hilo.hawaii.edu/maunakea/culture/management> (see guidance associated with completed CMP management action CR-8).

In addition to implementing the BTP, UH has and will continue to establish, implement, and regularly update guidelines that define such things as: (i) the way that lineal descendants and/or others wishing to visit burial sites should notify the Maunakea Rangers and other management staff in advance so that the visits can be made safely and securely; (ii) the way UH notifies commercial tour operators that visits to burial sites are prohibited; and (iii) the procedures, which are discussed in CR-1 (Section 3.4.1), that UH will follow to provide annual or more frequent updates to individuals that the Hawai'i Island Burial Council recognizes as lineal and cultural descendants of Ka'ohē Ahupua'a on the status of known burials on the mountain.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The information obtained during preparation of the 2021 OAR did not indicate a need to change these procedures at this time, i.e., no adaptive management actions are required.

3.4.7 CR-14: REPORT DISTURBANCE OF HISTORIC SHRINE OR BURIAL SITE

As part of their regular activities the Rangers will continue to monitor activities within the UH Management Areas on a daily basis and are in a good position to monitor for/observe disturbance of a historic property which may include shrines or possible burial sites and/or to take reports from others who have seen such actions. Changes to a historic property may include rebuilding or “restoration” of a shrine. Per this management action and consistent with HRS Chapter 6E and its implementing rules, the Rangers will immediately report historic property disturbances to CMS, and then CMS will immediately forward the report to DOCARE, KKM Council, and SHPD via electronic mail.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The word “historic” was added to the title of the management action to provide clarity. The text provides a description of reporting process that has been developed since the CMP was approved in 2009.

CHAPTER 4 NATURAL RESOURCE

4.1 INTRODUCTION

Section 7.1.2 of the 2009 CMP contains information and management actions intended to ensure the protection, preservation, and enhancement of the natural resources of the UH Management Areas. Based on a comprehensive review of existing scientific studies, biological and physical resource inventories, and historical documentation that are referenced in the 2009 CMP and OAR (Appendix A), the CMP addressed the protection and preservation of natural resources and examined human uses of the area, with particular emphasis on those uses' impacts on natural resources. Information concerning the current status of the natural resources can be found in Section 2.2 of the 2021 OAR (Appendix A).

4.2 DESIRED OUTCOME

The “desired outcome” with respect to natural resources is to:

Increase understanding of the status of natural resources (biotic and abiotic) and identify threats to these resources to better protect and preserve unique geological features, ecosystem functions, subalpine and alpine habitats, and biological communities through adaptive management of stressors and threats.

4.3 NEED

There is a need to continue the implementation of the CMP's management actions related to natural resources to avoid and/or minimize actual and potential impairment. The CMP strategies reflect a series of general precepts including:

- Sustainable management needs to allow for multiple uses and activities including astronomy and other scientific research, education, recreation, and cultural practices.
- UH needs to focus on limiting the impacts of human activities on natural resources, starting with educating/orienting individuals about the natural resources before they engage in uses and activities, so that they know how to minimize their impacts on the resources.
- Natural resources management planning should use an ecosystem¹⁷ approach.
- The planning and execution of natural resources management programs should involve the community during planning and implementation (including scientists, educators, volunteers, and the public—as well as from natural resource managers).

¹⁷ Ecosystem is defined as a dynamic system of living organisms (plants, animals, and microorganisms) within an area, the environment that sustains them, and their interactions.

Ecosystem management is an important concept in natural resource management. Management at the ecosystem level approaches the protection, enhancement, and restoration of natural resources from the perspective that ecosystems are structural wholes, and it recognizes that people, policies, and politics are as much a part of an ecosystem as are plants and animals. The five general goals of ecosystem management are: (i) maintaining viable populations; (ii) having a representation of all ecosystem types on the landscape; (iii) maintaining ecological processes, notably natural disturbance regimes; (iv) protecting the evolutionary potential of species and ecosystems; and (v) accommodating human uses of the landscape. These five goals have been incorporated into the natural resources management actions.

- The habitats and ecosystems in UH Management Areas are sensitive and unusual and, although not known to harbor threatened and endangered species, warrant protection.
- Enhancing the existing native bio-communities and rehabilitating damaged ecosystems is feasible in certain situations and should be conducted primarily in high-use areas where native biological communities may have become degraded or disturbed.
- Mitigating adverse impacts to natural resources by land uses and activities should be a component of the planning process (see also FLU-6).
- Long-term global environmental factors such as climate change should be considered when planning natural resource management activities.
- Ensuring that compliance personnel, such as Rangers, are present is necessary to ensure that rules and regulations are followed and natural resources are protected.
- Embracing UH's commitment¹⁸ to collaboratively build a global model of harmonious and inspirational stewardship that is befitting of Maunakea that is informed by and integrates indigenous and other management principles, including the kānāwai principles.

4.4 MANAGEMENT ACTIONS

As discussed in detail in Section 2.2 of the 2021 OAR and summarized in CHAPTER 2 of this document, only one (1) of the 18 management actions related to natural resources has been completed.¹⁹ The 17 that are ongoing are listed in Table 4.1 and detailed in Sections 4.4.1 through 4.4.17.

¹⁸ UH Board of Regents Resolution "Affirming Commitment to the Collaborative Stewardship of Maunakea's Cultural, Natural, Educational and Scientific Resources" adopted August 24, 2017.

¹⁹ Only NR-15, which called for UH to conduct baseline inventories of high-priority resources, has been completed, see Chapter 2.

Table 4.1 Ongoing Natural Resource Management Actions

| Mgmt. Action | Description | Discussion |
|--|---|-------------------|
| THREAT PREVENTION AND CONTROL | | |
| NR-1 | Limit threats to natural resources through management of activities and uses. | 4.4.1 |
| NR-2 | Implement the <i>Maunakea Invasive Species Management Plan</i> (C. Vanderwoude, February 2015) and modify, amend, and update it as warranted. | 4.4.2 |
| NR-3 | Minimize loss of native biodiversity. | 4.4.3 |
| NR-4 | Minimize barriers to species migration. | 4.4.4 |
| NR-5 | Allow, and where possible facilitate, ecosystems to respond to climate change. | 4.4.5 |
| NR-6 | Conduct educational efforts to generate public awareness about the importance of preserving Maunakea's natural resources. | 4.4.6 |
| ECOSYSTEM PROTECTION, ENHANCEMENT, AND RESTORATION | | |
| NR-7 | Protect areas with high biodiversity or unique communities/features from development. | 4.4.7 |
| NR-8 | Establish conditions under which UH would fence areas to keep out feral ungulates. | 4.4.8 |
| NR-9 | Increase native plant density and diversity through an outplanting program. | 4.4.9 |
| NR-10 | Require mitigation measures in plans for new development. | 4.4.10 |
| NR-11 | Conduct habitat rehabilitation projects following unplanned disturbances. | 4.4.11 |
| NR-12 | Plan and conduct habitat restoration activities, as needed. | 4.4.12 |
| PROGRAM MANAGEMENT | | |
| NR-13 | Increase communication, networking, and collaborative opportunities that support management and protection of natural resources. | 4.4.13 |
| NR-14 | Follow adaptive management principles when reviewing/updating programs. | 4.4.14 |
| INVENTORY, MONITORING, AND RESEARCH | | |
| NR-16 | Continue regular long-term monitoring. | 4.4.15 |
| NR-17 | Conduct research to fill knowledge gaps that cannot be addressed through monitoring. | 4.4.16 |
| NR-18 | Maintain geospatial database of natural resources. | 4.4.17 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | | |
| Source: Adapted from the 2021 OAR, Table 2.6. | | |

4.4.1 NR-1: LIMIT THREATS THROUGH MANAGEMENT OF ACTIVITIES AND USES

CMS' administrators and natural resource managers will continue to participate in the implementation of all the ACT-# coded management actions, which focus on managing activities and uses. Those management actions, which are discussed in Section 7.4 of this document, include such things as:

- Managing access and parking (ACT-1, ACT-2, ACT-4).
- Maintaining interpretive and compliance personnel (Rangers) on the mauna to educate users, deter violations, and encourage adherence to restrictions (ACT-3).
- Implementing guidelines to reduce impact of recreational hiking (ACT-5) and snow play (ACT-6).
- Confining tours and stargazing activities to previously disturbed areas and established parking areas (ACT-7) and managing commercial tours (ACT-9).
- Overseeing and providing recommendations concerning the issuance of film permits (ACT-10).

- Ensuring input by CMS staff, MKMB, KKM, and EC on all scientific research permits (ACT-12).

In addition, UH will continue to implement several other measures to minimize or prevent habitat alteration and disturbance related to:

- Facilities and land uses via the Future Land Use (FLU) management actions in Section 12.4.
- Construction activities via the Construction Guideline (C) management actions in Section 8.4.
- Inspecting facilities compliance with permits, rules, and regulations via the Permitting and Enforcement (P) management actions in Section 8.4, in particular management actions P-7 and P-8.
- Maintaining spill response materials in Ranger staff vehicles per management action OI-5 (Section 13.4.3).
- Requiring those entering the UH Management Areas have educated themselves through the orientation per management action EO-2 (Section 5.4.3).
- Removing trash at the end of each snow play season from areas where snow play has taken place, which will be done in addition to the Rangers' normal trash removal efforts as specified in management action ACT-6 (Section 7.4.6).
- Maintaining infrastructure in a manner that encourages compliance with rules and limits the potential for adverse impacts to resource per the Infrastructure and Maintenance (IM) management actions (Section 9.4).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during the preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, greater specificity and examples have been added to the discussion and those measures in the Natural Resources Management Plan (NRMP) that have been found to be effective/implementable have been incorporated.

4.4.2 NR-2: IMPLEMENT THE MAUNAKEA INVASIVE SPECIES MANAGEMENT PLAN

As discussed in the 2021 OAR, the *Maunakea Invasive Species Management Plan* (C. Vanderwoude, February 2015) provides detailed guidance regarding ways to limit the incursion of invasive species into the UH Management Areas. UH will continue to fully implement the measures called for in the plan.

The *Maunakea Invasive Species Management Plan* is an adaptive plan and will be updated as needed to be consistent with broader state or federal biosecurity guidelines, and to support any new guidelines or methods that increases our ability to effectively manage invasive species. New or modified Standard Operating Procedures (SOPs) will be put into effect as needed. Any updates to the plan or associated SOPs will follow guidelines identified in [SOP-Z: Revising the Invasive Species Management Plan](#). CMS will also continue to coordinate with neighboring land managers of other subalpine and alpine lands on Maunakea (NR-13, Section 4.4.13) regarding the management of invasive species. Input from those and other sources will inform updates and

adaptations to the *Maunakea Invasive Species Management Plan* and related measures, such as C-2 (Section 10.4.2).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The management action was adapted to recognize that a plan has been created, adopted, and is being implemented.

4.4.3 NR-3: MINIMIZE LOSS OF NATIVE BIODIVERSITY

As discussed in the 2021 OAR, the native plant and animal populations that are present within the UH Management Areas are a function of large-scale natural processes which are beyond the control of UH alone (for example, changes in rainfall and temperature due to climate change). However, CMS will continue to support this action through: (i) implementing the *Maunakea Invasive Species Management Plan* (NR-2, Section 4.4.2); (ii) conducting invasive weed removal (NR-2) including facilitating volunteer weed pull events (EO-8, Section 5.4.2.2); (iii) supporting efforts to increase native plant density and diversity (NR-9, Section 4.4.9); (iv) educating the public and stakeholders about resources (NR-6, Section 4.4.6); and (v) managing ecosystems to respond to climate change (NR-5, Section 4.4.5).²⁰ It will also continue to provide support for implementation of DLNR's 2011 *Mauna Kea Wildland Fire Management Plan* (Beavers, June 2011).

UH will continue to evaluate measures to address other causes of population and/or diversity decline, including habitat loss, sample collection, pollution, loss of pollinators and seed distributors, genetic bottlenecks, and small population size.²¹ For example, the following were identified in the NRMP and will continue to be considered as part of the adaptive management effort going forward:

- For loss of pollinator populations: (i) hand pollination (work with experts to develop guidelines or collaborate in existing programs); (ii) outplanting of greenhouse-grown plants to increase plant density; and (iii) collaborating with outside experts if opportunities present themselves to create and take advantage of opportunities for the rearing and re-introduction of native pollinators.
- For missing seed dispersers: (i) hand-spreading of seed (pre-treat seed, if necessary, for germination); (ii) re-introducing seed dispersers; and (iii) studying effectiveness of other species as seed dispersers.
- For fire prevention, control weeds in the following locations (particularly around Halepōhaku): (i) roadsides; (ii) pullouts used by the tour companies; (iii) unpaved parking lots and roads; and (iv) around Halepōhaku to create a firebreak.
- For fire threat reduction: (i) require tour companies not idle their vans in unpaved areas and (ii) provide educational signage requesting that visitors do not smoke on trails, in the DOFAW silversword enclosure, or in other unpaved areas.

²⁰ This includes training Rangers and staff to recognize new introduced plants and remove known invasive plants visible near observatories, roads, or other facilities, and in pavement cracks and retaining walls along the Mauna Kea Access Road.

²¹ In doing this, it will continue to consider the full range of measures discussed in the NRMP, but implementation of many of these is likely to be constrained by budgetary constraints.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, greater specificity and examples have been added to the discussion and those measures in the NRMP that have been found to be effective/implementable have been incorporated.

4.4.4 NR-4: MINIMIZE BARRIERS TO SPECIES MIGRATION

As discussed in the 2021 OAR, neither UH nor its sublessees have erected any structures that reduce the ability of species to migrate across UH Management Areas, and going forward, through implementation of the 2022 Master Plan and the Future Land Use (FLU) management actions (Section 12.4), UH will not undertake any actions that would create barriers to species migration. UH staff will continue to coordinate with Forest Reserve, Natural Area Reserve, and Department of Land and Natural Resources technical staff to identify issues, craft appropriate responses, and investigate concerns regarding ecosystems and flora and fauna populations (NR-13, Section 4.4.13).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, reference to the 2022 Master Plan, which is substantially different from the 2000 Master Plan in place when the 2009 CMP was drafted, have been added.

4.4.5 NR-5: ADDRESSING CLIMATE CHANGE

UH will continue to do what it can within the UH Management Areas to allow and facilitate responses to climate change. Examples of the kinds of actions that are supportive of this include, but are not limited to:

- Collecting weather data within the UH Management Areas and make it publicly available for use in climate change modeling and other studies.
- Examining weather data and other long-term monitoring information (NR-16) for trends and impacts potentially associated with climate change.
- Continuing to coordinate frequently with Forest Reserve and Natural Area Reserve staff (NR-13) to ensure that UH's management activities do not inadvertently impede natural ecosystem responses to change, including those related to climate change. Cooperation will allow the agencies to make better management decisions regarding climate change responses.
- Reducing non-climate stressors by limiting the further incursion of/removing existing invasive species (NR-2) so that native species within the UH Management Areas can adapt to climate change without added pressures from competition, predation, etc.
- Increasing native plant density by outplanting (NR-9) and conducting habitat restoration (NR-11) to enhance native ecosystems in a manner that aids or supplements the natural migration of communities and helps maintain ecosystem interactions.

- Collecting seeds from various individuals and at higher elevations (when possible) within the ecotype to increase genetic diversity, thereby helping ecosystems adapt to climate change.
- Considering information in recent publications and guidelines related to ecosystem resilience and climate change for inclusion in management activities (i.e. [U.S. Climate Resilience Toolkit](#)).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, additional references to other management actions and information in recent publications has been added.

4.4.6 NR-6: EDUCATE PEOPLE ABOUT MAUNAKEA’S NATURAL RESOURCES

As documented in the 2021 OAR, UH has implemented many measures aimed at reducing threats to Maunakea’s natural resources by educating those working in and visiting the UH Management Areas and the public about them.²² CMS is committed to continuing and expanding these efforts in the future. CMS will ensure that its natural resource staff participates in the implementation of all the EO-# coded management actions (CHAPTER 5). That participation will improve education program quality and help keep them current.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, adaptations to the overall educational programs are discussed in CHAPTER 5.

4.4.7 NR-7: PROTECT BIODIVERSE AND UNIQUE AREAS FROM DEVELOPMENT

As discussed in several sections of the 2021 OAR, UH has assembled additional information related to these topics for areas in the vicinity of the astronomy facilities and Halepōhaku since the CMP was completed, and the work is nearly complete. Moreover, its ongoing monitoring helps it better understand the ecosystem and CMS expects to conduct some additional research related to NR-7 as funding permits. Monitoring and research are being used to inform adjustments to management actions aimed at increasing the level of protection that is provided.

Protection from development will largely be achieved through implementing the 2022 Master Plan (FLU-1, Section 12.4.1), which calls for:

- Astronomy facilities to be restricted to a limited number of “astronomy sites” already being utilized and/or approved for astronomy facilities through conservation district use permits issued by BLNR.
- A preference for siting non-astronomy facilities in previously disturbed areas, including former astronomy sites.

²² See, for example, the 2021 OAR discussions of CR-3 (Section 2.1.3.3), community engagement (Section 3.1.3), ACT-3, P-4 (Section 3.5.2.5), and C-8 (Section 3.7.2.8).

- Repurposing/reusing existing facilities at Halepōhaku, rather than new construction, to accommodate the expanded educational activities that the 2022 Master Plan now envisions.

For those few and minor land uses that may be placed in areas not previously developed, it will remain important that areas with high biodiversity or unique communities/features continue to be known and avoided to the extent practicable. This includes areas with cultural and historic resources, unique geological features, and habitat for rare, threatened, or endangered native species. The implementation of other FLU-# management actions (Section 12.4) and the implementation of the proposal review process in the 2022 Master Plan will also contribute to the identification, delineation, and protection from development of important natural resources.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Adaptations centered on incorporating references to the FLU-# management actions (Section 12.4) and incorporating applicable aspects of the 2022 Master Plan.

4.4.8 NR-8: ESTABLISH CONDITIONS UNDER WHICH UH WOULD BUILD UNGULATE FENCES

The primary purpose of building fences is to keep feral ungulates out of areas. As discussed in the 2021 OAR, UH has not built any ungulate fences in the UH Management Areas and it is unlikely to do so given DLNR's efforts to encircle Maunakea with ungulate fencing at a lower elevation. Nevertheless, there may be conditions or situation under which UH would build ungulate fences. CMS, working with DLNR and the EC, will prepare a document that enumerates those conditions and/or situations. Then, should such a condition or situation arise, UH would propose building a fence. Because fencing is likely to qualify as a "land use" under the Conservation District Rules, those efforts will need to comply with the provisions of the 2022 Master Plan, including the proposal review process, prior to implementation.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that DLNR has made substantial gains in completing an ungulate fence at a lower elevation on Maunakea. Based on input from DLNR, this may not eliminate every situation under which UH might build a fence and UH should identify the situations under which it would build a fence.

4.4.9 NR-9: INCREASE NATIVE PLANT DENSITY AND DIVERSITY THROUGH AN OUTPLANTING PROGRAM

UH has established a greenhouse within the Halepōhaku parcel and will continue to maintain and utilize it to propagate native plants for outplanting to the UH Management Areas. All plants in the greenhouse will be grown from seeds collected locally within the ecotype (NR-5, Section 4.4.5), and approved by DLNR through CMS's seed collecting permit which will be renewed annually. CMS will continue to outplant subalpine species within Halepōhaku and potentially expand the program to the road corridor and neighboring Forest Reserve if needs are met within the UH Management Areas. The outplanting program at Halepōhaku will extend to establishing and maintaining native gardens that help educate the public by providing living examples of unique and rare plant species native to the region. In addition, CMS is working with DOFAW to propagate additional native species in the greenhouse to be out-planted in the alpine and subalpine ecosystems on Maunakea.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that UH has established a nursery and will utilize it to support specific outplanting efforts.

4.4.10 NR-10: REQUIRE MITIGATION MEASURES IN PLANS FOR NEW DEVELOPMENT

Commitments and provisions in the 2022 Master Plan will: (i) result in a contraction in astronomy uses through decommissioning and the reduction in the number of available astronomy sites; (ii) ensure future astronomy uses avoid adverse effects to natural resources by confining them to the existing astronomy sites; and (iii) require review and approval of all land use proposal by UH, including natural resource staff and specialists, during early planning phases.

As documented in the 2021 OAR (see, for example, Sections 3.6.2.1 and 3.9.2.6), UH's proposal review process requires those proposing new development within the UH Management Areas to incorporate, and UH to approve, measures to avoid, minimize, and mitigate potential adverse effects to natural resources, including sensitive habitats. This ensures that mitigation measures will be implemented as appropriate whenever new development occurs, and CMS will continue to enforce these requirements. In overseeing other entities' use of the lands that it manages, UH will:

- Ensure that any habitat that will be permanently removed is replaced on at least a one-to-one basis, through either creation of new habitat, restoration of degraded habitat, or by permanent protection of similar unique habitats.²³
- Make the full implementation of mitigation plans the responsibility of the proposal proponent.
- Require that those performing mitigation projects include a monitoring program in their plans that calls for at least three (3) years of monitoring to assess success and to inform future conservation projects in the region.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). References to the 2022 Master Plan have been added and, because UH has learned that the harshness of the environment means it can take longer to detect mitigation project benefits, effectiveness monitoring was increased to at least three years.

4.4.11 NR-11: CONDUCT HABITAT REHABILITATION PROJECTS FOLLOWING UNPLANNED DISTURBANCES

UH has conducted and will continue to conduct damage assessments for rehabilitation in the event of unplanned disturbances (e.g., spills, vehicle accidents). Habitat restoration is also an option following an unplanned disturbance. The nature of the appropriate rehabilitation or restoration will necessarily continue to be determined on a case-by-case basis following an assessment of the specific circumstances of the unplanned disturbance. The Maunakea Administrative Rules state that those engaged in permitted activities are responsible for corrective actions in the event of an accident or non-compliance with conditions. For example, if an unplanned disturbance occurs during a permitted construction project, that project, not UH, will be responsible for rectifying the

²³ Mitigation projects that result from a planned impact to designated critical habitat or threatened or endangered species will have different requirements, which will be established through coordination with the USFWS.

unplanned disturbance, under UH's supervision. Should a disturbance be the result of other activities (for example, public access) or due to the cumulative impacts of multiple activities, UH will both assess and rectify the unplanned disturbance. Examples of unplanned disturbances that may require rehabilitation or restoration responses include:

- Discrete incident disturbance, such as:
 - Off-road driving or vehicle accidents.
 - Construction equipment disturbing areas beyond their approved limits.
 - Hazardous material spills.
- Cumulative disturbance, such as:
 - Cinder compaction and soil erosion from overuse of existing dirt roads and trails.
 - Creation of new trails, trail widening, or trail realignment.
 - Stormwater runoff causing erosion, which is of particular concern at Halepōhaku.

Depending on the scope and scale of the rehabilitation or restoration, effectiveness monitoring may be appropriate to assess success and inform future conservation projects in the region.

Because certain rehabilitation and restoration response efforts are likely to qualify as “land uses” under the Conservation District Rules, those efforts will need to comply with the provisions of the 2022 Master Plan prior to implementation.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The discussion expanded to clarify who is responsible for rehabilitation and added some examples and details.

4.4.12 NR-12: PLAN AND CONDUCT HABITAT RESTORATION ACTIVITIES, AS NEEDED

As discussed in the 2021 OAR (see, for example, Sections 2.2.8.3, 2.2.9.3, and 2.2.10.3), UH intends to continue habitat restoration as needed and as the opportunities present themselves. The effort will continue to be informed by the extensive information collected by UH during the preparation and implementation of the CMP. This management action is closely associated with management actions NR-8 (Section 4.4.8) and NR-9 (Section 4.4.9). Also associated is the restoration of the astronomy sites, which is discussed in SR-2 (Section 11.4.1) and SR-3 (Section 11.4.2).

The greenhouse at Halepōhaku will continue to be used to support restoration activities within the UH Management Areas and elsewhere on Maunakea. CMS will endeavor to see that restoration planning is coordinated with the other agencies (NR-13) that operate on Maunakea, many of which have existing restoration programs or projects that might be expanded to include UH Management Areas. Where appropriate, it will seek funds and staff resources that will allow it to provide assistance or funding for habitat restoration activities in response to requests from other parties conducting activities on Maunakea and provide guidance and techniques for restoration planning.

Habitat restoration efforts involve three phases: (i) planning, (ii) implementing, and (iii) monitoring effectiveness. Efforts within the UH Management Areas will focus on the following:

- Creating viable habitat for the endangered Palila bird (*Loxioides bailleui*), other native bird species, and for native insects and pollinators such as the Hawaiian Yellow-faced bees

(*Hylaeus spp.*), which are critical to the reproductive success of many native plant species.²⁴ The only portion of the UH Management Areas that is within the Subalpine Māmane Woodlands is Halepōhaku. The area is too small (~19 acres) to establish an independently viable woodland plot. However, it is located at the upper reaches of māmane woodlands which can provide some habitat and resources for native birds that follow the elevational flowering patterns of māmane. This upper elevation māmane woodlands can also serve as a refuge where birds can escape from avian malaria which is expected to extend its range higher on the mountain as climate change accelerates and raises the mosquito line. Neighboring land managers are also working on bird corridors to connect the lower elevation māmane woodlands to the higher elevation woodlands, and the UH managed lands will play a role in those efforts. This area is also suitable (and is being used for) the propagation of native subalpine and alpine plants on Maunakea.

- Supporting efforts to increase the density and abundance of endangered Mauna Kea silversword, or ‘āhinahina (*Argyroxiphium sandwicense sandwicense*). Mauna Kea silversword has historically been found on Maunakea at elevations from 8,500 feet to 12,300 feet and two small wild populations are still present in that range.
- Improving wēkiu bug habitat where habitat is impaired.
- Restoring roadside native plant communities in the distinctive ecological zones between 9,500-13,000 feet.
- Continuing invasive species management (NR-2, Section 4.4.2) that is vital for supporting restoration efforts.

Restoration effectiveness should be monitored for at least three (3) years following completion to assess success and inform future conservation projects in the region. Moreover, because the results of restoration are unlikely to be fully felt within three years, UH will attempt to budget for a subsequent follow-up survey at the 8 to 10-year mark.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The focus areas were added, as informed by UH’s experience managing the area since the CMP was approved. Effectiveness monitoring was also added to provide consistency with other restoration and mitigation management actions.

4.4.13 NR-13: INCREASE COMMUNICATION, NETWORKING, AND COLLABORATION THAT SUPPORTS MANAGEMENT AND PROTECTION OF NATURAL RESOURCES

As discussed in various parts of the 2021 OAR (see, for example, Sections 3.1.3 and 3.10.2.1), UH has established the relationships and put in place the communication procedures needed to carry out this measure. UH’s overall outreach effort, which incorporates this management action, is discussed in detail in the “Outreach/Coordination Cluster” in Section 5.4.2.

UH is working vigorously to continue and strengthen these relationships and the fruit they bear. For example, it is: (i) producing reports to inform stakeholders, public, and collaborating agencies about the status of the natural resources; (ii) sharing its reports with collaborating agencies and stakeholders; (iii) placing its summary reports on its website, where they are readily available to

²⁴ The subalpine māmane woodlands on Maunakea which includes Halepōhaku is designated as critical habitat for the Palila.

the general public; (iv) presenting the results of its management activities and monitoring program at scientific meetings; (v) producing this CMP 2022 Supplement detailing changes over time, and resource responses to management actions; and (vi) increasing the level of effort that it expends coordinating with the public and with the Maunakea Watershed Alliance, DLNR, and other agencies and organizations.

UH is also continuing to identify opportunities for collaborative data collection and resource management. It is doing this by (i) regularly communicating and meeting with other natural resource management agencies and scientists to discuss natural resource conditions on Maunakea; (ii) hosting such meetings at Halepōhaku or UH Hilo facilities; (iii) inviting agencies, researchers, and others involved in high-elevation natural resource management or research in Hawai‘i to undertake work on Maunakea; (iv) sharing data with other agencies and using data collected by other agencies; and (v) entering into agreements with collaborating agencies as needed to facilitate cooperative work.

The COVID-19 pandemic, budget limitations, and organizational and staff changes have limited the extent to which UH has been able to pursue networking and collaboration opportunities over the past few years. However, CMS has made the re-establishment of close ties with land management groups a high priority and is working collaboratively with the staff of ‘Imiloa Astronomy Center (‘Imiloa) to establish new relationships and partnerships that it believes will enable UH to better achieve the CMP’s desired outcomes.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, greater specificity has been added to the discussion and those measures in the NRMP that have been found to be effective/implementable have been incorporated.

4.4.14 NR-14: FOLLOW ADAPTIVE MANAGEMENT PRINCIPLES WHEN REVIEWING/UPDATING PROGRAMS

In accordance with this measure, UH will continue to use the principles of adaptive management when developing programs and methodologies. As discussed in the 2021 OAR, UH has established and continues to implement a process through which potential adjustments and revisions to CMP management actions are informed by data collected and documented in annual reports and periodic updates. Similarly, it regularly updates program plans, such as the *Maunakea Invasive Species Management Plan* (C. Vanderwoude, February 2015), as it learns from experience and communicates these to interested parties at MKMB meetings and elsewhere.

During the adaptation of all management actions, and in particular those related to natural resources, Native Hawaiian knowledge and methods will continue to inform updates to existing and the establishment of new programs and methodologies. Specifically, this will include new knowledge accumulated through the implementation of NR-4 (Section 3.4.4) and the kānāwai principles discussed in the MKWG Report (Mauna Kea Working Group, December 2021).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

4.4.15 NR-16: CONDUCT REGULAR LONG-TERM MONITORING

UH will continue to conduct regular long-term monitoring within the UH Management Areas. The authors of the 2009 CMP anticipated that the long-term monitoring would be conducted in accordance with an “inventory, monitoring, and research plan.” For a variety of reasons, CMS has concluded that a single formal inventory, monitoring, and research plan would not be useful as there are multiple, coordinated programs that are already in place which serve this purpose. These ongoing long-term monitoring programs will continue.

Generally, the long-term monitoring effort will be periodically reviewed. The review will involve the following steps:

1. Re-evaluating which resources to monitor. This will involve an assessment of data gaps, consideration of trends in the data collected to date, and an appraisal of the metrics that UH does or could track and report per the CMP management action MEU-1 (Section 14.4.1).
2. Considering new monitoring tools, methodologies and research and update established monitoring guidelines based on available information.
3. Writing or revising resource-specific monitoring plans so that they fully consider such things as whether the monitoring can: (i) be accomplished using in-house staff; (ii) be streamlined to address multiple resources, minimize expenses while improving safety, and avoid impacts to the resources; and (iii) focus on the provision of scientifically and statistically sound data that can be used to identify trends and program needs.
4. Implementing monitoring plans.
5. Drawing conclusions, evaluating if the correct resources are being monitored, and considering if existing monitoring should continue or the program adapted by returning to step 1.

Some of the underlying objectives of the long-term monitoring include:

- Measuring progress toward achieving the desired outcome.
- Identifying trends (range expansion or contraction, population size or density changes, etc.) in the status of natural resources.
- Detecting short-term changes and threats to high-elevation ecosystems.
- Detecting long-term changes and threats to high-elevation ecosystems.
- Assessing the effectiveness of enhancement, mitigation, restoration, and rehabilitation projects so that lessons can be applied to future projects.

Continuing long-term monitoring will involve:

- Continuing to obtain data on certain climatic parameters (e.g., temperature, precipitation, wind, etc.).
- Annual arthropod monitoring.
- Invasive species monitoring/early detection, prevention, rapid response, and control efforts (NR-2).

- Tracking the outcome of the restoration and rehabilitation projects that are undertaken (NR-11, NR-12, and others).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The concept for an inventory, monitoring, and research plan has been removed for the reasons presented above. Those measures in the NRMP that have been found to be effective/implementable, such as the six-step process, have been incorporated. Including list of some of the long-term monitoring topics were added.

4.4.16 NR-17: CONDUCT RESEARCH TO FILL KNOWLEDGE GAPS THAT CANNOT BE ADDRESSED THROUGH MONITORING

The OAR describes the extensive research that UH has funded since the CMP went into effect and notes that the results of that research have helped guide many of the ongoing management actions that UH is carrying out. UH will continue to seek funding for research projects deemed appropriate to filling data gaps and inform its management actions. The research funding will be based on a rigorous evaluation and prioritization process. In developing its proposed research funding priorities, CMS will:

- Maintain and regularly update a list of potential research projects based on knowledge gaps identified during completed and ongoing reviews, studies, monitoring, and research.
- Prioritize research projects based on:
 - The breadth of the results' applicability (e.g., a research project that can provide information that will be useful for management of a variety of natural resources or a large area would generally be prioritized over research whose results are applicable to only a single resource or a small area).
 - The immediacy of the need for the information the results would provide (e.g., a question that must be answered quickly to prevent a significant decline in conditions in natural resources, would be given a high priority).
 - The status of the resource being researched (e.g., research on endangered species would generally be prioritized over research on a native but non-threatened species).
 - The speed with which information must be available to be useful (e.g., research into natural resources that respond very quickly to perturbations would generally be prioritized over those that are slower to respond).

Based on its prioritized list of desirable research projects, CMS will continue to work with scientists to develop research guidelines and seek funding for prioritized research projects. In doing this, it will:

- Review literature and consult with experts regarding methodologies best suited to answer research questions.
- Assess where the research project can be conducted and determine if enough replicates can be established to ensure statistical rigor, consulting with statisticians as needed.
- Explore opportunities for collaboration or cooperation with other land management agencies (NR-13), especially if the resource being studied crosses property boundaries.

- Review research guidelines to ensure compatibility of data with the data already obtained.
- Estimate personnel and equipment and supplies costs of the research and seek the internal and/or outside funding needed to complete the project.
- Obtain, when appropriate, peer review from other natural resource managers and local experts, if feasible.

Regardless of whether the research is conducted by CMS' own staff or by outside entities, CMS will:

- Enter the data into the CMS database. When the research is conducted by CMS's own staff, the goal will be to assemble and analyze the data the research generates within a year of the completion of the dataset's collection.
- Prepare and issue a report summarizing the results of research, with a goal of doing so within one year of the completion of the analysis. For long-term research projects, if any, a summary progress report will be prepared annually.
- Share the results of research projects through attendance at conferences and meetings, publication in scientific journals, publication on CMS website and newsletter, and through press releases, as appropriate and desired.

CMS will evaluate the information obtained through relevant studies and, where appropriate, use it to:

- Evaluate the success of the research, i.e., the extent to which it answered the questions that had been posed.
- Assess the extent to which the research had identified (or left) gaps in the data or raised further questions that ought to be the subject of further investigations.
- Use the information obtained from the research to improve the way in which resources are managed (i.e., adaptive management, NR-14).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Those measures in the NRMP that have been found to be effective/implementable, such as how research funding is prioritized, have been incorporated.

4.4.17 NR-18: MAINTAIN GEOSPATIAL DATABASE OF NATURAL RESOURCES

As described in the 2021 OAR, a GIS database of resources surveyed utilizing ArcGIS and distributed as GoogleEarth layers has been developed; as new data becomes available, it is added to this database. CMS will maintain that database and commits to entering additional data into it as rapidly as staffing and other resource limitations allow.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

CHAPTER 5 EDUCATION AND OUTREACH

5.1 INTRODUCTION

Section 7.1.3 of the 2009 CMP established eight management actions regarding UH's education and outreach efforts (EO-1 through EO-8). As used in the CMP, the term "Education" includes providing information about natural, cultural, and astronomical resources to the public, through on-site and off-site materials and programs. The term "Outreach" refers to activities intended to increase public participation in the stewardship of Maunakea, through community engagement and community involvement in resource management activities, especially through volunteer-based programs. Information concerning the current status of education and outreach can be found in Section 3.2 of the 2021 OAR (Appendix A).

The discussion of education and outreach are presented as "clusters" in this supplement. This is done to better capture, in one section, the diverse CMP management actions that address these two topics and to avoid repetition and inconsistency. Importantly, clustering reflects UH's holistic approach to them and identifying opportunities for place-based and community-based programs that can amplify UH's efforts and benefits to the community.

5.2 DESIRED OUTCOME

The "desired outcome" for the education and outreach program is to:

Build and maintain a constituency to engage in active and meaningful stewardship of Maunakea, through education and involvement of the public, to support/enhance conservation, and sustain the natural, cultural, and astronomical resources of Maunakea.

5.3 NEED

5.3.1 EDUCATION NEEDS

As discussed in the 2021 OAR and in accordance with the guidance contained in UH's recently updated 2022 Master Plan, protecting Maunakea's unique resources in the face of the increasing numbers of persons who wish to visit it requires improved methods and programs to adequately educate visitors about such things as: (i) the status and threats to natural and cultural resources; (ii) appropriate vehicle use; (iii) personal safety; and (iv) applicable laws, rules, and regulations while visiting the mountain. UH has made great strides related to education but there remains a need to continue and enhance the programs that have been established. Specific educational needs include the following:

- Producing a succinct video that provides an orientation for visitors, which is required in the Maunakea Administrative Rules, and incorporates Native Hawaiian cultural perspectives and cultural sensitivity.
- Enhancing efforts to present the orientation and provide other information to the entire community.

5.3.2 OUTREACH NEEDS

As outlined in the 2021 OAR and in accordance with the guidance contained in UH's 2022 Master Plan, there is a need for greater effort to reach and inform the Native Hawaiian community so that input from its members informs decision-making. This outreach should be done in coordination with management action CR-1 (Section 3.4.1). At the same time, continuing outreach to and participation by other community constituencies remains important. In accordance with this there is a need to redouble effort regarding outreach and community engagement in a manner that results in:

- The community being in the decision-making process early and often through the CMS volunteer advisory groups (e.g., MKMB, KKM, and EC) and diverse community engagement and outreach activities.
- Diverse community representation on the CMS volunteer advisory groups.
- Focusing efforts to improve engagement with the Native Hawaiian community to address issues identified in the *Independent Evaluation of the Implementation of the Mauna Kea Comprehensive Management Plan* (Kuiwalu, December 2020).

5.4 MANAGEMENT ACTIONS

As discussed in detail in Section 3.2 of the 2021 OAR (Center for Maunakea Stewardship, August 2021), all eight of the education and outreach management actions (Table 5.1) are ongoing.

Table 5.1 Ongoing Education and Outreach Management Actions

| Mgmt. Action | Description | Discussion |
|--|--|------------|
| Program Development | | |
| EO-1 | Modify, amend, and update the <i>Maunakea Education & Outreach Plan</i> (MEOP) (University of Hawaii, December 2019) as warranted. | 5.4.1 |
| Education | | |
| EO-2 | Require orientation of all persons accessing the UH Management Areas in a manner consistent with the MEOP and Maunakea Administrative Rules. | 5.4.3 |
| EO-3 | Consistent with the MEOP, continue to develop, update, and distribute materials explaining important aspects of Maunakea. | |
| EO-4 | Consistent with the MEOP, implement the <i>Maunakea Sign Plan</i> (Office of Mauna Kea Management, February 2017) and modify, amend, and update it as warranted. | |
| EO-5 | Consistent with the MEOP, develop interpretive themes and features. | |
| EO-6 | Consistent with the MEOP, engage in outreach and partnerships with schools. | |
| Outreach | | |
| EO-7 | Consistent with the MEOP, continue and increase opportunities for community members to provide input on management plans and activities. | 5.4.2 |
| EO-8 | Consistent with the MEOP, continue and increase opportunities for community members to participate in stewardship activities. | |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | | |
| Source: Adapted from the 2021 OAR, Table 3.11. | | |

Through the course of implementing the CMP, UH has learned that the eight education and outreach management actions are complementary and draw from the same materials. That is why the *Maunakea Education & Outreach Plan* (MEOP) (University of Hawaii, December 2019) address all of them at some level. Furthermore, other CMP management actions are closely

associated or directly related to these EO management actions. Therefore, this group of CMP management actions are discussed as two clusters – the “Outreach Cluster” (Section 5.4.2) and the “Education Cluster” (Section 5.4.3) – in order to avoid repetition and confusion by discussing each management action separately.

5.4.1 EO-1: MAINTAIN THE MAUNAKEA EDUCATION AND OUTREACH PLAN

The *Maunakea Education & Outreach Plan* (MEOP) (University of Hawaii, December 2019) was developed collaboratively by representatives of ‘Imiloa Astronomy Center, Maunakea Observatories, the Maunakea Visitor Information Station (VIS), and OMKM and approved by the MKMB in July 2020.²⁵ The implementation of the MEOP is addressed in Sections 5.4.2 and 5.4.3. Hence, this section concerns only its modification, amendment, and updating.

The MEOP does not specify a process for its modification or amendment, nor does it specify that it needs to be updated after the passage of a certain period of time or the occurrence of a certain event. Currently, CMS anticipates that it will monitor the effectiveness of the measures called for in the plan on an ongoing basis and will adjust the activities it engages in as quickly as it is able. It will formally modify, amend, and/or update the MEOP document as appropriate and consistent with adaptive management principles.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Because the MEOP has been adopted this management action now addresses the modification, amendment, and updating based on the principles of adaptive management.

5.4.2 OUTREACH/COORDINATION CLUSTER (EO-7, EO-8, AND RELATED)

The outreach/coordination cluster of CMP management actions includes all those actions that address outreach and coordination. There are management actions in several CMP sections that guide outreach and coordination activities, sometimes broadly as EO-7 does, and sometimes specifically, such as NR-13, which guides outreach to agencies and entities with similar natural resource management challenges. To avoid repetition or inconsistency, all the outreach and coordination management actions are listed and discussed together in this section as a “cluster.”

The CMP management actions in the outreach/coordination cluster include the following:

- EO-7: Consistent with the MEOP, continue and increase opportunities for community members to provide input on management plans and activities. All the outreach and coordination activities associated with this management action are discussed in this section and involve the implementation of the MEOP.
- EO-8: Consistent with the MEOP, continue and increase opportunities for community members to participate in stewardship activities. All the outreach and coordination activities associated with this management action are discussed in this section and involve the implementation of the MEOP.

²⁵ Note: The CMP calls for the education and outreach plan to “...outline the process and discuss a venue for mandatory visitor orientation, and community consultations.” The program that was formally adopted makes the program “mandatory” only for “users”, which Section 1.1.1 of the MEOPO defines as “...individuals working under the auspices of a land-use permit on Maunakea. Examples of users include observatory employees, observatory vendors, University support staff, and other public agency employees.” However, mandatory visitor orientation is addressed further in EO-2.

- EO-1: Maintain the Maunakea Education and Outreach Plan (Section 5.4.1). This management action concerns the modification, amendment, and/or updating of the MEOP when deemed appropriate. The MEOP provides guidance for all outreach and coordination activities.
- EO-6: Consistent with the MEOP, engage in outreach and partnerships with schools. To the extent that this action involves outreach to the schools, it is addressed in this section; education programs that involve schoolteachers and/or students are discussed in Section 5.4.3.
- CR-1: Engage with Cultural Community and Develop and Maintain Appropriate Guidance Regarding Cultural Issues (Section 3.4.1). Briefly, this management action discusses: (i) maintaining a CR-1 mailing list (a list of Native Hawaiians and others with cultural interests) and providing those on the list with timely updates regarding MKMB agendas, land use proposals, the development of cultural guidelines, reports, and other items of potential interest, and (ii) providing regular updates to the individuals that the Hawai'i Island Burial Council officially recognizes as cultural descendants of Ka'ōhe Ahupua'a.
- NR-13: Increase Communication, Networking, and Collaboration that Supports Management and Protection of Natural Resources (Section 4.4.13). This management action involves identifying opportunities for collaborative data collection and resource management with agencies and entities with similar lands, needs, and/or experience.
- P-5: Coordinate Enforcement Efforts with Other Agencies (Section 8.4.4). This management action involves UH sharing Ranger reports and actively coordinating with other agencies (e.g., NAR, DOFAW, U.S. Fish and Wildlife Service (USFWS), and others) regarding enforcement of the rules and regulations that are applicable within the UH Management Areas and on immediately adjacent lands.
- OI-3: Coordinate Approach to Resource Management (Section 13.4.1). This action involves UH working closely with neighboring landowners and managers (e.g., DLNR, Department of Hawaiian Home Lands (DHHL), Mauna Kea Watershed Alliance, and others) to coordinate its actions within the UH Management Areas with their activities.

So that outreach and coordination is considered comprehensively, UH stewardship staff (CMS, 'Imiloa, and potentially others) involved in outreach and coordination activities associated with the UH Maunakea Lands will be aware of all these CMP management actions, their interrelationships, and their directives.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The cluster approach detailing the outreach and coordination management actions reflects UH's efforts to integrate and consolidate outreach across all topics of concern within the UH Management Areas. The management actions also recognize that plans have been established to aid this effort.

5.4.2.1 Outreach Overview

CMS will continue its implementation of the outreach called for in the CMP and the MEOP, including ongoing efforts to expand opportunities for community members to: (i) provide input to cultural and natural resources management activities on Maunakea and (ii) ensure systematic input regarding planning, management, and operational decisions that affect natural resources, sacred

materials or places, or other ethnographic resources with which they are associated. This will include such things as contacting local civic and environmental groups, local experts in natural and cultural resources, families with lineal and cultural connections to Maunakea, kūpuna, cultural practitioners, the Office of Hawaiian Affairs, and other Native Hawaiian groups.

One component of this effort is to distribute information to the community so that the public remains well-informed. An equally important component is to continue collecting community input so that CMS can adjust its efforts accordingly. In furtherance of this outreach effort, CMS will continue to regularly update its list of community members who wish to be notified and from whom input should be sought on the following:

- Implementation of UH's 2022 Master Plan and CMP, including any updates, revisions, or amendments to them.
- Land use proposals being evaluated by UH (e.g., astronomy facilities, conservation actions, etc.).
- Proposed procedures and guidelines (e.g., concerning appropriateness of constructing new Hawaiian cultural features, invasive species SOPs, etc.) that are being developed.
- The availability of new information (e.g., Annual Archaeological Monitoring Reports, research reports, etc.).
- Other actions being considered or reports prepared by/for UH and CMS that may be of interest or concern to the community.

Information will be distributed and input sought via the method(s) that CMS's experience regarding community interest in a topic or product suggests would be most appropriate. As discussed in the 2022 Master Plan, one of UH's strategies is to involve the community in the decision-making process early and often through the CMS volunteer advisory groups (e.g., MKMB, KKM, and EC) and diverse community engagement and outreach activities. The methods that CMS will use may include:

- Posting on CMS website.
- Distribution to mailing list (via Email and/or U.S. mail).
- Inclusion in eNewsletters distributed by CMS.
- Regular updates regarding current activities and interaction with interested community members will be undertaken via CMS' website and social media accounts.
- Informal talk-story sessions (telephone, virtual meetings, and in-person meetings) with community members.
- Discussions with community representatives during advisory group (KKM, EC, and MKMB) meetings and with the public during MKMB meetings.²⁶
- Formal virtual and in-person meetings, open houses, and forums.

Some agencies and several types of community members will receive additional focus under the outreach program, they include:

²⁶ UH is diversifying community representation on the CMS volunteer advisory groups, including KKM, EC, and MKMB. This is included as a strategy in the 2022 Master Plan.

- DLNR, generally as the agency responsible for the lands and as the agency that issued the permits for the existing land uses, and specifically certain divisions as follows: (i) OCCL related to planning and land use; (ii) SHPD related to historic and cultural resource monitoring and protection (P-5: Coordinate Enforcement Efforts with Other Agencies (Section 8.4.4)); (iii) DOFAW related to overall management and ecosystem restoration (NR-13: Increase Communication, Networking, and Collaboration that Supports Management and Protection of Natural Resources (Section 4.4.13)); and (iv) DOCARE related to enforcement in general (P-5: Coordinate Enforcement Efforts with Other Agencies (Section 8.4.4), criminal enforcement (ACT-1: (Section 7.4.1)), and issues related to hunting (ACT-8: Monitor Hunting Activity and Adherence to Applicable DLNR Hunting Rules (Section 7.4.8)). UH will meet with DLNR representatives at least once a year to address these and other topics.
- Families with lineal and cultural connections to Maunakea, cultural practitioners, OHA, and other Native Hawaiian groups (CR-1: Engage with Cultural Community and Develop and Maintain Appropriate Guidance Regarding Cultural Issues (Section 3.4.1)).
- Other nearby property owners (OI-3: Coordinate Approach to Resource Management (Section 13.4.1)).
- Others (e.g., state agencies, federal agencies, nearby landowners, and non-governmental organizations) conducting conservation, restoration, and rehabilitation projects, especially those that involve volunteers, on Maunakea or in similar environments (NR-13: Increase Communication, Networking, and Collaboration that Supports Management and Protection of Natural Resources (Section 4.4.13)).
- Schools in association with EO-6 and expanding education for Hawai‘i’s students (Section 5.4.3.3).

5.4.2.2 Community Opportunities to Participate in Stewardship Activities

CMS anticipates continuing and intensifying the opportunities it creates for community members to participate in stewardship activities. Examples of these include workshops, meetings with citizen advisory groups, volunteer opportunities, and school-related programs that will help involve children. To the extent that these opportunities occur on UH Maunakea Lands, all participants will be required to comply with applicable provisions of the CMP and Maunakea Administrative Rules. Among other things, participants will need to have viewed the Maunakea orientation (Section 5.4.3.1) and park their vehicles in designated areas. These programs will also be offered and operated in a manner consistent with UH’s intent to: (i) not expand its VIS offerings in a manner that would generate a greater number of visitors and (ii) preserve the ambiance and feeling of the cultural landscape and minimize adverse effects on the alpine and subalpine ecosystems and other resources.

After evaluating the CMP’s and OAR’s recommendation that UH establish a docent program to provide guided tours highlighting the cultural landscape and natural resources, CMS is evaluating the feasibility (from a cost, staffing, and desire to limit visitation levels) of reinstituting the kind of guided driving tours that ran on Saturdays and Sundays between 2005 and 2015 and was available to those having their own 4WD vehicle. Beginning with a safety brief by CMS staff at the VIS, knowledgeable volunteer docents could then lead guests up the Mauna Kea Access Road while stopping to describe various cultural, natural, and scientific points of interest.

CMS has made/is in the process of making arrangements for a variety of service projects that fulfill stewardship objectives that are in both the CMP and the 2022 Master Plan while also providing education and enjoyment to volunteers. Examples of the kind of such efforts that were made in the past (prior to 2016) include weekly trail maintenance by VIS staff on the path to Pu‘ukalepeamoia and twice-annual trash pickup along the Humu‘ula trail; both were intended to help reduce the impact of visitors and educate staff. In doing this UH is cooperating and collaborating with other entities that run volunteer-based projects. One aspect of that collaboration would be to increase the volunteer pool so that UH and others could conduct larger-scale projects on Maunakea than would be impossible with only their in-house resources.

The kinds of projects related to natural resources that CMS believes could benefit most from greater community participation include: (i) basic maintenance, such as trash pick-up and inspection for damage to facilities or signs; (ii) care of the botanical enclosure, such as weeding, watering, and inspecting the enclosure; (iii) enhancing native plant communities, such as weeding, outplanting, and care of native species around VIS and dormitories; (iv) trail maintenance and development; and (v) restoration projects for native plant communities. Potential service projects related to the cultural landscape that appear most likely to benefit from greater public participation in stewardship activities include the involvement of archaeology students and interested persons from the Native Hawaiian community knowledgeable in field methods related to the monitoring of cultural properties.

In addition to these “action-oriented” items, meetings of the MKMB, KKM, and the EC provide opportunities for members of the community to discuss and provide advice regarding the way the mountain is managed and the specific types of stewardship programs that ought to be undertaken. The latter is intended to be responsive to the concerns that some community members, particularly members of the Native Hawaiian community, have expressed about UH not listening and responding appropriately to their concerns and/or not undertaking certain stewardship activities they believe are important.

5.4.3 EDUCATION CLUSTER (EO-2, EO-3, EO-4, EO-5, EO-6, AND RELATED)

The education cluster of CMP management actions includes all those actions that address educational efforts. There are management actions in several CMP sections that direct educational activities, sometimes broadly as EO-3 does, and sometime specifically, such as CR-3, which addresses cultural elements of the educational effort. To avoid repetition or inconsistency, all the education management actions are listed and discussed together in this section as a “cluster.” Another aspect of the cluster is to approach education more holistically and identify opportunities for place-based and community-based educational programs that can amplify their benefits. The CMP management actions in this cluster include the following:

- EO-2: Require orientation of all persons accessing the UH Management Areas in a manner consistent with the Maunakea Administrative Rules. All activities associated with this management action are discussed in this section (Subsection 5.4.3.1).
- EO-3: Consistent with the MEOP, continue to develop, update, and distribute materials explaining important aspects of Maunakea. All activities associated with this management action are discussed in this section (Subsection 5.4.3.2).
- EO-4: Consistent with the MEOP, implement the *Maunakea Sign Plan* (Office of Mauna Kea Management, February 2017) and modify, amend, and update it as warranted. All

activities associated with this management action are discussed in this section (Subsection 5.4.3.2).

- EO-5: Consistent with the MEOP, develop interpretive themes and features. All activities associated with this management action are discussed in this section (Subsection 5.4.3.2).
- EO-6: Consistent with the MEOP, engage in educational partnerships with schools. All activities associated with this management action are discussed in this section (Subsection 5.4.3.3).
- EO-1: Maintain the Maunakea Education and Outreach Plan (Section 5.4.1). This management action concerns the modification, amendment, and/or updating of the MEOP when deemed appropriate. The MEOP provides guidance for all education activities.
- CR-3: Conduct Educational Effort to Raise Public Awareness of Importance of Preserving the Cultural Landscape (Section 3.4.3). This management action involves the cumulative implementation of all the education activities outlined in this section.
- NR-6: Educate People About Maunakea's Natural Resources (Section 4.4.6). This management action involves the cumulative implementation of all the education activities outlined in this section.
- ACT-3: Maintain Ranger Program (Section 7.4.3). This management action involves the continuation of the Maunakea Rangers and is detailed in Subsection 5.4.3.4.
- P-4: Promote Manager and Permittee Awareness of Applicable Rules & Permit Requirements (Section 8.4.3). This management action involves the cumulative implementation of all the education activities outlined in this section.
- IM-2: Require Maintenance Worker Orientation (Section 9.4.2). This management action involves the cumulative implementation of all the education activities outlined in this section.
- C-7: Educate Construction Workers Regarding Historical and Cultural Significance (Section 10.4.7). This management action involves the cumulative implementation of all the education activities outlined in this section as they apply to personnel working on construction projects within the UH Maunakea Lands.
- C-8: Educate Construction Workers Regarding Environment, Ecology, and Natural Resources (Section 10.4.8). This management action involves the cumulative implementation of all the education activities outlined in this section as they apply to personnel working on construction projects within the UH Maunakea Lands.

UH will endeavor to provide all education materials discussed in this section in a multilingual format (i.e., make them available in English, Hawaiian, Japanese, etc.) as deemed appropriate.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The cluster approach detailing the education management actions reflects UH's efforts to integrate and consolidate educational efforts across all topics of concern within the UH Management Areas. The management actions also recognize that a plan has been established to aid this effort and that 'Imiloa has been engaged to aid in educational efforts, particularly orientations.

5.4.3.1 Mandatory Visitor Orientation

HAR § 20-26-5 provides that:

As set forth in the comprehensive management plan, all persons accessing the UH management areas shall be required to complete an orientation regarding cultural and natural resources, safety matters, and other relevant information prior entering the UH management areas.

UH has required and provided an orientation for those working on the mountain since 2013. The worker orientation program will continue to be a more robust orientation than the visitor orientation program that CMS is implementing. Astronomy facility staff, tour operators, support staff, contractors, vendors, Rangers, and others working within the UH Maunakea Lands will be required to complete the worker orientation prior to starting their work. The worker orientation will consist of an approximately 25-minute video and will require satisfactory scores on a brief assessment quiz given at its conclusion. The updated worker orientation video, produced by ‘Imiloa, will be placed on the CMS website once complete (<https://hilo.hawaii.edu/maunakea/stewardship/orientation>). The worker orientation must be repeated every three (3) years, more frequently if required by a permit, or as directed by UH in accordance with the Maunakea Administrative Rules. For those working on Maunakea under a permit (CDUP or permit issued under the Maunakea Administrative Rules), participation is tracked and CMS will continue to report summary statistics annually to BLNR.

The requirement that all visitors²⁷ also receive and demonstrate reasonable proficiency with the material contained in the orientation is relatively new. ‘Imiloa is developing a brief (approximately 10 minute) visitor orientation video that will satisfy this requirement. It will be posted on the CMS website. Enforcement of the visitor orientation requirement will require procedures, personnel, and equipment that have, with some exceptions, not heretofore been in place. CMS believes that the most efficient implementation method is by making orientation enforcement part of its overall program to manage access to the UH Maunakea Lands, which is discussed in CMP management action ACT-1 (Section 7.4.1).

5.4.3.2 Develop, Update, & Distribute Materials Explaining Important Aspects of Maunakea

As described in Section 3.2.2.3 of the 2021 OAR, UH has prepared a variety of printed materials covering topics such as safety, cultural landscape, natural resources, and recreational activities and is continuing to distribute these free of charge from various outlets (e.g., VIS, IfA/CMS office in Hilo, ‘Imiloa, commercial tour operators, at events CMS holds or attends, etc.). It also makes copies of most of these available on its website. These materials have included and will continue to include:

- Informational brochures (available as handouts and on website), which will be updated periodically by knowledgeable personnel, regarding the following: (i) Visiting Maunakea Safely and Responsibly; (ii) Maunakea Heritage and Natural Resources Guide²⁸ (English and Japanese versions); (iii) copies of previous literature shared with visitors to Maunakea and at public events (e.g., “*Maunakea: Ka piko kaulana o ka ‘aina* (the famous summit of the land)” cultural significance brochure).

²⁷ Visitors are defined as individuals entering the UH Management Areas that are not working under the auspices of a CDUP or permit issued under the Maunakea Administrative Rules.

²⁸ This document is scheduled for updating during 2022.

- Displays at the VIS that educate the public about the prehistory and history of Maunakea, encourages the preservation of the cultural landscape and natural resources, and inform the public about the restrictions and precautions associated with the landscape and resources. Certain exhibits were mostly recently updated in July 2020. The exhibits will continue to be updated periodically by knowledgeable personnel, including ‘Imiloa representatives.
- Periodic CMS newsletters that include new information or findings related to the cultural landscape, natural resources, and other important aspects of Maunakea.

CMS is, in cooperation with ‘Imiloa, also developing more interactive web-based products that it believes will reach an even-broader audience. Examples of the items that it is developing and expects to deploy include the following:

- An augmented reality exhibit that uses GIS data to share different aspects of Maunakea and Hawai‘i Island.
- Measures that feature greater ease of access to in-depth content and source material (cultural, historical, astronomical, management, and natural history).
- Content additions to the CMP website.
- CMS social media accounts, including Facebook and Instagram.

Physical signs are another important educational material medium. As discussed at length in Section 3.2.2.4 of the 2021 OAR, The *Maunakea Sign Plan* (Office of Mauna Kea Management, February 2017) was formally adopted in February 2017, and it has guided and will continue to guide the design, installation, and maintenance of all signage on the mountain. The plan will be modified, amended, and updated as warranted. Signs will be integrated into the overall educational program so that information on signs is consistent with information provided on brochures and displays and the various modes of education enhance each other. This is especially applicable to interpretive signs, but applies to all sign types.

Several of the specific recommendations in the *Maunakea Sign Plan* have not yet been implemented. Those items, as well as the steps that CMS is committed to taking to implement them, include the following:

- As a preliminary step to updating hazard and safety information signs, CMS completed a sign inventory in 2021. The inventory includes roadway and building signs within the UH Management Areas. The next step is to assess need, content, and siting for any new signage. Efforts will be made to consolidate messaging as much as possible and to eliminate unnecessary signs to keep the number of signs at a minimum.
- CMS will work with responsible agencies, including DLNR, and its advisory groups to explore creation and installation of wayside signs at appropriate locations on the summit region and in designated parking areas. Such signs may be modeled on existing DLNR waysigns at Pu‘uhuluhulu and Kaulana Manu Nature Trail.
- CMS staff anticipates a redesigned VIS patio in 2022 showcasing the unique aspects of Maunakea. General visitor information will be displayed on posters mounted to a VIS wall. Mobile patio exhibits will showcase other aspects of importance.

- While CMS continues to consider areas appropriate for use as a future nature trail or heritage walk, the still-young Native Plant Restoration area near the VIS is presently too delicate for this purpose. Other options continue to be considered.
- Regulatory signage will be posted in appropriate areas with appropriate citations in order to provide proper notice to the public of applicable provisions of the Maunakea Administrative Rules. A copy of the rules is online and is available at the VIS for the public's reference.

As indicated in Section 3.2.2.5 of the 2021 OAR, thus far UH has made only limited progress with respect to the development of interpretive features and activities that would make information about, and interaction/experience with, cultural and natural resources more available to those visiting the UH Maunakea Lands. Specifically, because it has struggled to appropriately balance input from advisory groups, concerns related to health and safety, and the imperative to conserve the resources, UH has not yet implemented a number of the possibilities for interpretive features mentioned in the CMP. UH will continue to consider the integration of the following interpretive functions into its integrated education programs:

- A self-guided tour (using brochures or previously downloaded podcasts) of geological resources in the summit region.
- Development of one or more small pullout gardens along the Mauna Kea Access Road, between Halepōhaku and the summit region, planted with representative vegetation and accompanying interpretive signage, to illustrate change of vegetation communities with an increase in elevation.

5.4.3.3 *Educational Partnerships with Schools*

The OAR documents the many ways in which UH has interacted with the community over the years since the CMP was adopted. It has entered into partnerships with many schools by collaborating with local experts, teachers, and university researchers, and by working with 'Imiloa, which is a part of UH Hilo. CMS' partnerships with schools will continue. The following are examples of the programs that UH will continue, and expand on, to continue and strengthen its partnerships with schools:

- Hosting educational programs and school visits at UH Hilo and Halepōhaku, and community programs such as AstroDay and The Universe Tonight.
- Participating in the UH Hilo Pacific Internship Programs for Exploring Science.
- Maintaining the Akamai Internship Program, which mentors students and prepares them for careers.
- Expanding the Maunakea Scholars program, one component of which involves high school students being allocated telescope time.
- Summer HI STAR Program.
- Providing education opportunities to schools and students on a broad range of topics through the Multidisciplinary Field Station concept slated for Halepōhaku.

5.4.3.4 Rangers

The Rangers will continue to be UH's primary means of ensuring public safety, protecting resources, encouraging appropriate behavior, and monitoring compliance with permit conditions and applicable rules. The Rangers will continue to play a lead role in educating the public about the cultural significance and environmental uniqueness of Maunakea and the ways in which visitors can remain safe and minimize their impact on the landscape. In addition, the Rangers have authority to issue citations under the Maunakea Administrative Rules and will do so when appropriate. Ensuring that the Rangers continue their primary interpretive and education roles on Maunakea will enable them to also continue their responsibilities related to other management actions, including:

- CR-14: Report Disturbance of Historic Shrine or Burial Site (Section 3.4.7). This management action involves the Rangers reporting observed disturbance of shrines or burial sites to CMS and other entities.
- ACT-3: Maintain Ranger Program (Section 7.4.3). This management action involves the continuation of the Maunakea Rangers for interpretive and compliance purposes. The interpretive portion of this responsibility is discussed in this section and the compliance aspect is detailed in Section 7.4.3.
- ACT-8: Monitor Hunting Activity and Adherence to Applicable DLNR Hunting Rules (Section 7.4.8). Rangers report suspected hunting violations observed on DLNR lands to DLNR, including DOCARE.
- P-1: Comply with Applicable Laws, Regulations, and Permit Conditions (Section 8.4.1) and P-7: Review Facility Compliance with CDUPs (Section 8.4.5). Related to these management actions, the Rangers monitor activities for compliance and will continue to conduct inspections of the summit observatories and Halepōhaku facilities for compliance with their CDUPs.
- P-4: Promote Manager and Permittee Awareness of Applicable Rules & Permit Requirements (Section 8.4.3). This management action involves the cumulative implementation of all the education activities outlined in this section.
- P-8: Enforce Conditions contained in UH-Issued Permits (Section 8.4.6). Rangers' responsibilities include monitoring compliance with the conditions of commercial tour operator permits and the conditions of special use permits issued by CMS.
- IM-5: Finalize & Implement Debris Removal, Monitoring, and Prevention Plan (Section 9.4.5). Rangers, as well as the CMS's VIS and natural resource staff routinely check for and pick up trash and debris in accordance with the approved *Debris Removal, Monitoring, and Prevention Plan* while on their daily patrols.
- OI-3: Coordinate Approach to Resource Management (Section 13.4.1). Rangers report unusual or suspicious behavior observed on DLNR lands to DLNR, including DOCARE.

CHAPTER 6 ASTRONOMICAL RESOURCES

6.1 INTRODUCTION

Section 7.1.4 of the 2009 CMP established two management actions intended to preserve the conditions that make the UH Management Areas so well-suited for astronomy research. Section 3.3.1 of the 2021 OAR (Center for Maunakea Stewardship, August 2021), discusses the status of the two management actions, AR-1 and AR-2. Information concerning the current status of the astronomical resources can be found in Section 3.3 of the 2021 OAR (Appendix A).

6.2 DESIRED OUTCOME

The “desired outcome” with respect to astronomy resources is:

Astronomical resources shall be protected by preventing the intrusion of activities and uses incompatible with astronomy facilities, such as those that generate nuisance light, dust, and radio frequencies.

This desired outcome has been adapted to focus on the scientific resources and eliminate terms that have or may become obsolete.

6.3 NEED

Astronomical resources are subject to actual and potential impact from incompatible uses or activities in the summit region. Without planned protections and a commitment to protect astronomical resources, adverse effects may occur. Measures to protect other resources in the UH Management Areas, such as the cultural landscape and natural resources (management actions CR-# and NR-#), will also protect astronomical resources, to a degree. A few additional measures are necessary to address specific concerns related to astronomical resources.

6.4 MANAGEMENT ACTIONS

As discussed in Section 3.3 of the 2021 OAR, both of the management actions in the CMP (AR-1 and AR-2) that are intended to preserve the conditions that make Maunakea so well-suited for astronomy research are ongoing. The actions are summarized in Table 6.1 and a discussion of each is presented below in Sections 6.4.1 and 6.4.2.

Table 6.1 Ongoing Astronomy Resource Management Actions

| Mgmt. Action | Description | Discussion |
|--|--|------------|
| AR-1 | Manage activities and uses in the UH Management Areas to avoid, minimize, or mitigate adverse impacts to astronomical resources. | 6.4.1 |
| AR-2 | Prevent light pollution, radio frequency interference (RFI) and dust. | 6.4.2 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | | |
| Source: Adapted from the 2021 OAR, Table 3.12. | | |

6.4.1 AR-1: LIMIT THREATS THROUGH MANAGEMENT OF ACTIVITIES AND USES

The sublease terms between UH and the operators of the non-UH astronomy facilities and the conditions UH includes with permits issued under the Maunakea Administrative Rules have proven extremely effective in protecting the value of the summit area for astronomical research. UH will continue to incorporate similar and/or more restrictive clauses in all new agreements it enters. Additionally:

- Proposed land uses will be subject to the proposal review process outlined in the 2022 Master Plan and an astronomy resource specialists will participate in that review, as appropriate. Specific attention will be placed on adherence to the design guidelines related to dust, lighting, and radio frequency interference (RFI).
- CMS' administrators and astronomy resource specialists will continue to do their utmost to ensure that they perform the ACT-# coded management actions (Section 7.4), which focus on managing activities and uses, in such a way as to forestall negative impacts on astronomical resources.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, this action now specifies that an astronomy resource specialist will participate in ACT-# coded actions to be consistent with components of the CR and NR management actions.

6.4.2 AR-2: PREVENT LIGHT POLLUTION, RADIO FREQUENCY INTERFERENCE, AND DUST

UH will enforce the provisions in the Maunakea Administrative Rules that authorize UH to continue to provide the astronomical resource protection called for in the CMP. The best examples of this, perhaps, may be found in HAR § 20-26-23, which prohibits radio transmissions, artificial illumination, and other activity that materially interferes with the scientific and educational operations of the astronomical facilities or research equipment within the UH Management Areas above Halepōhaku and in the restrictions on vehicular travel contained in HAR § 20-26-38. Regarding RFI, activities and uses will be required to comply with the Maunakea Observatories Summit Radio Frequency Transmitter Policy, which may be updated from time to time.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

CHAPTER 7 ACTIVITIES AND USES

7.1 INTRODUCTION

Section 7.2.1 of the 2009 CMP contains management actions related to scientific research work, cultural activities, and recreational activities and uses within the UH Management Areas. While the original CMP notes that the best known and most prominent scientific activity on Maunakea at the time was astronomical research, other fields of scientific research, including archaeology, biology, geology, and meteorology, are also described. The CMP also refers to the cultural and religious practices associated with the mountain, including prayer, burial, construction of small shrines, and other rituals. Finally, the CMP acknowledges the value of the recreational activities that occur in the UH Management Areas, including sightseeing of the natural beauty and scenic areas, stargazing, snow play, hiking, biking, and hunting.

Information concerning the current status of activities and uses can be found in Section 3.4 of the 2021 OAR (Appendix A). Section 3.4.1 of the 2021 OAR reviews the “Permitted General Uses” and the “Permitted Public Uses” in the CMP. Importantly, it notes that many of those are the same as those that are included in the Maunakea Administrative Rules, which is consistent with the provisions of the CMP.

The *Revised Management Plan for the UH Management Areas on Mauna Kea* (University of Hawaii, March 1995), which the CMP refers to as the *1995 Management Plan*, is no longer referenced because it has been replaced by the Maunakea Administrative Rules, elements of this document (e.g., Section 7.4.2), and elements of the 2022 Master Plan.

7.2 DESIRED OUTCOME

The “desired outcome” with respect to activities and uses is:

To retain and enhance recreational and cultural activities, ensure regulation of commercial activities, and support scientific studies while maintaining adequate protection of resources, educating users regarding resource sensitivity, and ensuring the health and safety of those visiting or working at Maunakea.

7.3 NEED

Public access to Maunakea has become much easier since the construction of the Mauna Kea Access Road, and, more recently, improvement of Daniel K. Inouye Highway (aka Saddle Road). These developments have led to far greater numbers of people entering the UH Management Areas than was once the case. Managing activities and uses within the UH Management Areas involves managing (i) access to the UH Management Areas, and (ii) the facilities and uses that are developed and operated within the UH Management Areas. Such measures will help protect resources, enhance safety, and maintain the unique qualities of Maunakea.

Needs to manage activities and uses include:

- Developing education, citation, enforcement, and appeal procedures within CMS to implement the Maunakea Administrative Rules
- Implementing the 2022 Master Plan, which addresses new facilities and uses.

- Implementing CMP management actions that address public and commercial access and activities.
- Monitoring and documenting visitor activities, including numbers entering, times of day present, locations accessed, and their impacts to the resources.

7.4 MANAGEMENT ACTIONS

As discussed in Section 3.4 of the 2021 OAR and summarized in CHAPTER 2 of this document, 11 of the 12 CMP management actions related to activities and uses are ongoing.²⁹ Those actions are listed in Table 7.1, and the nature of the work that is continuing are summarized in Sections 7.4.1 through 7.4.11.

Table 7.1 Ongoing Activity and Use Management Actions

| Mgmt. Action | Description | Discussion |
|------------------------------------|--|------------|
| General Management | | |
| ACT-1 | Development and implement robust access management guidelines and procedures. | 7.4.1 |
| ACT-2 | Implement and enforce Maunakea Administrative Rules to reduce impacts of parking and traffic. | 7.4.2 |
| ACT-3 | Maintain the Ranger program to educate and encourage adherence to rules and guidelines and enforce Maunakea Administrative Rules. | 7.4.3 |
| ACT-4 | Maintain and strengthen infrastructure to educate and encourage adherence to rules and guidelines. | 7.4.4 |
| Recreational Activities | | |
| ACT-5 | Implement and enforce Maunakea Administrative Rules to reduce impacts of recreational hiking. | 7.4.5 |
| ACT-6 | Manage snow play activities in a manner that minimizes its impacts and maintains public safety and welfare. | 7.4.6 |
| ACT-7 | Confine UH and other sponsored (non-commercial) tours and stargazing activities to previously disturbed ground surfaces and established parking areas. | 7.4.7 |
| ACT-8 | Support DLNR conservation resource enforcement officers by monitoring and reporting hunting activity and adherence to applicable DLNR hunting rules. | 7.4.8 |
| Commercial Activity Permits | | |
| ACT-9 | Implement and enforce Maunakea Administrative Rules pertaining to commercial tour permitting. | 7.4.9 |
| ACT-10 | Provide input on permits for filming activities. | 7.4.10 |
| Other Activity Permits | | |
| ACT-12 | Vet all proposals for activities that require a research or special use permit under the Maunakea Administrative Rules. | 7.4.11 |
| Note: | The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | |
| Source: | Adapted from the 2021 OAR, Table 3.13. | |

7.4.1 ACT-1: DEVELOP AND IMPLEMENT ACCESS MANAGEMENT GUIDELINES AND PROCEDURES

Under HAR § 20-26-38, UH is authorized to implement the following specific access management measures, among others as reasonable:

²⁹ Only ACT-11, which called for UH to obtain statutory authority to regulate commercial activities within the UH Management Areas has been completed, see Chapter 2.

- Install a gate or other control structure (with the approval of BLNR) to manage vehicular access to the UH Management Areas.
- Close or limit access to all or portions of the UH Management Areas when needed for protection from hazardous conditions, including but not limited to inclement weather, construction or maintenance activities on or near the roadway or at astronomy facility sites, transportation of wide, heavy, or otherwise hazardous loads, or roadway congestion.
- Limit access by private vehicles for public safety and welfare, for the protection of resources, and to reduce congestion. Restrictions may include, but are not limited to, setting a maximum number of private vehicles allowed within the UH Management Areas at any one time, restricting the areas in which private vehicles may operate, or requiring the use of shuttle vehicles in lieu of private vehicles.
- Limit public access hours for the UH Management Areas, provided that hunters have access to hunting areas pursuant to UH's land authorizations and DLNR's hunting rules.

UH understands that access management is one of the most sensitive (and desired) issues for the public. No access management proposals will be developed without substantial public outreach and input. Therefore, it will likely be a few years before an access management project is permitted and implemented. CMS is exploring implementing access management measures in phases; the phases include:

- An initial phase that may involve the installation of certain infrastructure that is outlined in the 2022 Master Plan (e.g., a manned kiosk, an optional gate, etc.). The establishment of procedures that are consistent with the rules that include such things as: (i) conducting spot-checks to ensure that occupants of vehicles proceeding above Halepōhaku have completed the orientation program; (ii) establishing a reservation and ticketing system that would allow UH to track and, at certain times of day, limit the number of vehicles proceeding above Halepōhaku; and (iii) requiring certain visitors pay fees prior to entrance.
- A shuttle phase that may involve such things as: (i) the construction of additional improvements and infrastructure as outlined in the 2022 Master Plan; (ii) the adoption and implementation of guidelines and procedures that are consistent with the Administrative Rules that result in most or all visitors entering the UH Management Areas doing so via a shuttle; and (iii) cooperating with the DHHL or another organization and/or concessionaire to operate the shuttle, especially if the shuttle base facility is on DHHL land.

CMS will continue to gather input on its contemplated managed access phases. Each phase will be developed into a proposal that involves infrastructure (e.g., land uses) and guidelines and procedures (e.g., management measures that are consistent with the Administrative Rules) that work together to contribute to the desired outcome (Section 7.2). During proposal development UH may test temporary access management measures to help assess and obtain public input on the location of the access management point, staffing requirements, measures that could be incorporated to help improve compliance with the Maunakea Administrative Rules, and guidelines/technology (e.g., reservation system) related to how access is managed. Those proposals will be vetted and acted on through the proposal review and approval process outlined in the 2022 Master Plan. CMS anticipates that both phases are likely to borrow from similar access management systems that the State or Counties have already implemented (e.g., Hā'ena State Park, Hanauma Bay State Park, and Diamond Head State Monument).

When fully implemented, these measures (including the possible shuttle system) have the potential to significantly reduce visitor-related vehicular traffic in the UH Management Areas, with the greatest reduction felt on the particularly sensitive stretch above Halepōhaku.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action has been extensively adapted based on progress UH has made on several components of this management action (e.g., studying an access fee structure), access to other state lands has successfully been managed, and voluminous input received from the community regarding access management. In addition, references to the 1995 Management Plan have been replaced by references to the Maunakea Administrative Rules.

7.4.2 ACT-2: IMPLEMENT RULES AND GUIDELINES TO REDUCE IMPACTS OF PARKING AND TRAFFIC

As discussed in Section 3.4.2.2 of the 2021 OAR, UH has used capital improvement funds to implement various ingress/egress upgrades and area improvements to address concerns of traffic flow and pedestrian safety. In addition, having the Maunakea Administrative Rules in place puts UH in a position to enforce those CMP management actions that have parallel provisions in the rules.

The need for and management of parking within the UH Management Areas will go hand in hand with UH's approach to managing access (ACT-1, Section 7.4.1). UH will also actively enforce the Maunakea Administrative Rules, including HAR § 20-26-28, which addresses several aspects of vehicles and transportation (e.g., it prohibits operating or parking vehicles on trails or roads not designated for vehicle use and parking in undesignated areas).

In furtherance of its effort to reduce the impacts of vehicle use and parking, CMS will continue to:

- Distribute maps, at both the VIS and online, delineating designated parking areas along with materials informing visitors about safety concerns.
- Maintain informational and interpretive traffic and parking signs.
- Have Rangers monitor access, traffic, and parking; educate visitors; and, when necessary, enforce the rules.

On high traffic days such as snow days and during special events (e.g., solstice, eclipse, or meteor showers), UH may manage parking and traffic as described in ACT-6 (Section 7.4.6) regarding snow play.

These measures will reduce the potential impacts of vehicular movements and parking in the UH Management Areas and maintain safety.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action has been adapted based on progress UH has made related to providing parking and managing ingress/egress and incorporates the Maunakea Administrative Rules.

7.4.3 ACT-3: MAINTAIN RANGER PROGRAM

The Ranger program has been active since 2001. The 2009 CMP indicated that “The ranger program has been successful in providing a presence on the mountain for operational and visitor

support,” and “the program could support a mix of enforcement and interpretive rangers” that “deter violations and encourage adherence to restrictions.” As discussed in the 2021 OAR (Section 3.1.7), the Ranger program continues to successfully satisfy those management needs.

UH will continue to maintain the Ranger program, which provide a presence of interpretive and compliance personnel on the mountain. An overview of the many management actions the Rangers play a role in is provided in Section 5.4.3.4. This management action is the core CMP management action for the Rangers, but the Chief Ranger and other managers should be cognizant of the many other management actions where the Rangers play a role.

The Ranger’s primary role will continue to be educational and interpretive in nature. They will focus on deterring violations and encourage adherence with applicable rules using a relatively light-handed approach with positive public messaging and friendly in-person warnings to individuals and groups out of compliance. Among the many methods employed by the Rangers, their activities may include informal discussions with visitors as they enter the UH Management Areas to encourage compliance with rules and guidelines, including access management and visitor orientation requirements.

The Ranger’s secondary role will be to enforce the Maunakea Administrative Rules. Should the Ranger’s education and interpretive efforts not result in the desired compliance, then they will issue administrative citations and/or take other appropriate actions, which may include contacting DOCARE and Hawai‘i County Police Department officers for assistance in the event of violations of the Conservation District Rules, penal code, or other applicable rules. Rangers enforcement of the Maunakea Administrative Rules will consist of them issuing citations that can lead to penalties being imposed as provided for in HAR § 20-26-73 and HAR § 20-26-74. To fully implement the Maunakea Administrative Rules, UH will:

- Develop citation, enforcement, and appeal procedures within CMS.
- Provide training, materials, and support to Rangers.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action has been adapted to clarify that the Rangers can enforce the Maunakea Administrative Rules within the UH Management Areas.

7.4.4 ACT-4: MAINTAIN AND STRENGTHEN INFRASTRUCTURE TO EDUCATE AND ENCOURAGE ADHERENCE TO RULES AND GUIDELINES

UH will continue to maintain infrastructure to educate and encourage adherence to rules and guidelines. Maintenance of infrastructure overall is more thoroughly discussed in the IM-# management actions (Section 9.4); this management action reinforces the need to maintain and strengthen infrastructure with the intent of encouraging adherence to rules and guidelines. Infrastructure that encourages adherence to rules and requires periodic maintenance includes, but is not limited to, the following:

- Roads and Parking Areas. These will be maintained in good condition so that drivers are not tempted to leave the designated areas.

- Restrooms and Trash Receptacles. These will be maintained so that people have access to comfort stations and can easily/securely/appropriately dispose of their trash, which will discourage littering.
- Guardrails and Boulder Barriers. These visual and physical barriers to vehicles leaving designated areas (i.e., roads and designated parking areas) will be maintained, supervised, and in some cases constructed.
- Signs. Signage that directs and educates people will be installed and maintained, and periodically updated, replaced, or renewed.
- Visitor Information Station. The VIS will be maintained, staffed, and equipped in a fashion that allows it to adequately serve the needs of visitors.
- CMS Website. The CMS website is expected to be an ever-more-important means of educating those who use the mountain and encouraging them to adhere to the applicable rules and regulations.

UH will also seek to strengthen these examples and other types of infrastructure that educate and encourage adherence to rules and guidelines. To the extent that such strengthening requires a land use, proposals will be developed and vetted per the proposal review process outlined in the 2022 Master Plan prior to implementation. In some cases, land use approvals already exist that allow for the strengthening of infrastructure if it is found that existing infrastructure is insufficient to achieve the desired result (e.g., the placement of additional boulders to discourage off-road vehicle travel if it is found that people are circumventing the boulders originally placed, or replacing signs to improve messaging).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). UH has expanded this management action from infrastructure to discourage off-road vehicle use to all types of infrastructure because UH has learned that a wide range of infrastructure is needed to encourage compliance with rules and guidelines.

7.4.5 ACT-5: IMPLEMENT RULES AND GUIDELINES TO REDUCE IMPACTS OF RECREATIONAL HIKING

As discussed in Section 3.4.2.5 of the 2021 OAR, UH is doing its best to keep a limited, well-maintained, trail network within the UH Management Areas as a means of minimizing the development of new, unwanted trails by individuals and groups. Accordingly, UH is actively enforcing the provisions of HAR § 20-26-21(10), which specifically prohibits hiking, conducting nature study, or conducting any activity on pu‘u unless on designated trails or roads, except by written permit. Similarly, HAR § 20-26-28 prohibits operating or parking vehicles on trails or roads not designated for vehicle use.

In furtherance of its effort to reduce the impacts of recreational hiking, CMS:

- Distributes maps, at both the VIS and online, delineating designated trails accessed from the UH Management Areas along with materials informing visitors about safety concerns. Hikers are informed that off-trail hiking is prohibited; and alerted of safety concerns, including the fact that hiking alone at high elevations is dangerous, particularly in bad weather and/or late in the day and that it is best if one hikes with one or more buddies.

- Maintains informational and interpretive traffic and trail signs.
- Has Rangers periodically monitor and patrol recreational trails.
- Highly encourages hikers to self-register at the VIS.

CMS has also established guidelines regarding any proposed new trail or substantial alteration of an existing route (both of which are considered land uses in the Conservation District). Proposals must comply with the 2022 Master Plan's proposal review process and be fully permitted prior to implementation. That planning and permitting process may include seeking input from community groups, advice from CMS advisory groups, and receiving SHPD approval.

Due to human health and safety concerns, as well as resource impact concerns, UH does not anticipate establishing any new trails in the MKSR. Designated trails in the MKSR are limited to (i) the summit or Kūkahau'ula trail, which extends from Astronomy Site 9 (former Hōkū Kea site) to Pu'uwēkiu, the true summit and the highest point on Maunakea, (ii) the trailhead near the Batch Plant for the Humu'ula Trail into the NAR that leads to Lake Wai'au and Halepōhaku, and (iii) the trailhead at Parking 2 for the trail that goes to the Lake Wai'au Trail in the NAR. People can also hike along the shoulders of the roadways. UH has posted signs discouraging use of the track from Astronomy Site 12 (SMA) to the summit of Pu'upoli'ahu, as this is not a designated footpath.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time, but this clarifies why UH does not intend to develop any new trails.

7.4.6 ACT-6: REGULATE SNOW PLAY

As discussed in Section 3.4.2.6 of the 2021 OAR, HAR § 20-26-39 specifically authorizes UH to restrict and/or prohibit skiing, snowboarding, sledding, and other similar winter or snow sports to maintain public safety and welfare, to prevent damage to resources, and to minimize conflicts among visitors. It also bans formally or informally organized contests, meets, or competitions, snow play tours, or other similar events for skiing, snowboarding, sledding or other forms of snow recreation or snow activities and the operation of snowmobiles, all-terrain vehicles, or other motorized vehicle used for snow recreation.

The regulation of snow play will generally be achieved by:

- Informing the public whether snow play is allowed or not each day.³⁰ Such information will be provided using means and methods that prove efficient and effective, which may evolve over time.
- Posting signs or using other methods to inform visitors of some of the risks inherently associated with snow play.
- Maintaining a Ranger presence in the summit region to monitor public safety and welfare, prevent damage to resources, and minimize conflicts among visitors.

³⁰ Generally, snow play will only be allowed on days when: (i) the road is sufficiently clear of hazards to allow safe public access and (ii) there is sufficient snow coverage and depth that snow play will not pose a threat to resources.

- Maintaining a Ranger presence in the summit region when snow play is not allowed but visitors may be tempted to attempt snow play (e.g., days where snow is present, but not at sufficient depth or coverage) to enforce the prohibition.

During periods when snow play is particularly heavy and the Rangers feel it is appropriate, they will continue their practice of establishing one-way traffic flow on the summit area loop road so that vehicles are able to move safely when the designated parking areas are full and many cars are parked along the sides of the roadway.

At the end of each snow play period, CMS will conduct a trash inspection and removal in snow play areas in addition to areas the Rangers normally monitor for trash during their daily patrols.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Adaptations clarify aspects of the snow play guideline. They also eliminated the suggestion that Rangers will delineate snow play areas on a map; this was eliminated because the Rangers have found that (i) appropriate areas are different day-to-day, storm-to-storm, and (ii) snow play is largely a self-regulating activity, with people generally not venturing to areas where there is no snow or conditions are unsafe.

7.4.7 ACT-7: CONFINE SPONSORED TOURS TO PREVIOUSLY DISTURBED AREAS

UH will continue to confine UH and other sponsored (non-commercial) tours and stargazing activities to previously disturbed ground surfaces and designated parking areas within the UH Management Areas. This will be achieved through monitoring compliance with conditions applied to Research Permits and Special Use Permits issued per HAR § 20-26-61, 62, and 63.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time, but references to the Maunakea Administrative Rules were added to this management action, which had a one sentence description in the 2009 CMP.

7.4.8 ACT-8: MONITOR HUNTING ACTIVITY AND ADHERENCE TO APPLICABLE DLNR HUNTING RULES

Under the existing general lease, BLNR reserved “[a]ll hunting and recreation rights” subject to BLNR’s rules. As discussed in Section 3.4.2.8 of the 2021 OAR, UH has worked with DLNR to ensure that recreational hunting within the UH Management Areas is consistent with applicable DLNR regulations. As codified in HAR § 20-26-3, where there is a conflict between the HAR Chapter 20-26 and DLNR rules, then the DLNR rules govern. HAR § 20-26-3(d) further states that UH’s rules will be implemented in such a way as to allow hunting in accordance with DLNR’s hunting rules. Complementary assurances regarding hunting are provided elsewhere in UH’s rules as well [see, for example, HAR § 20-26-4; HAR § 20-26-21(8); HAR § 20-26-27; HAR § 20-26-32; and HAR § 20-26-38(c)].

In addition to adhering to the provisions related to hunting contained in the aforementioned rules, moving forward CMS will meet with Hawai‘i Island DOFAW representatives to be sure that CMS is aware of issues that hunting may raise. If this coordination reveals outstanding issues, CMS will follow up with DOFAW staff and/or hunters to see if the problems can be resolved. Finally, CMS staff will continue to proactively inform DOFAW and/or the Big Island hunting community

on a timely basis of any events and/or issues they believe may be of particular concern, including observations of parties engaged in hunting in a manner that is inconsistent with applicable hunting rules. These outreach efforts are part of the outreach management action (Section 5.4.2.1).

Hunters, like other visitors to the UH Management Areas, will be required to comply with the Maunakea Administrative Rules. The rules likely to be most applicable to hunters are those related to vehicles and parking, which are discussed in ACT-2 (Section 7.4.2).

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Clarify that UH and DLNR have agreed that DLNR hunting rules apply to the UH Management Areas and that, therefore, no additional policy regarding recreational hunting is required. Therefore, the primary UH action related to hunting will be to monitor hunting activity, which is why the title of this management action has changed.

7.4.9 ACT-9: OVERSEE COMMERCIAL TOUR PERMITTING PROCESS

As discussed in several sections of the 2021 OAR (see, for example, Sections 3.4.2.7 and 3.4.2.9), UH currently maintains close oversight and control of the commercial tour permitting process, and that will continue. Specific requirements are spelled out in HAR § 20-26-64, entitled “Commercial tour activity permits.” UH will continue to attach conditions to commercial tour permits; those conditions are designed to minimize potential tour impacts on the cultural landscape and natural resources. Conditions may evolve over the years but UH will always require tour materials to be approved by CMS and confine commercial tours to limited areas that have previously been disturbed.

In collaboration with the UH Mānoa’s Travel Industry Management program, UH initiated a study intended to assess the capacity for commercial tour operations in the UH Management Areas. Based on those findings and recommendations, CMS is exploring the contracting flexibility with respect to commercial tour operations that HAR § 20-26-64 provides. Specifically, it is considering whether to issue one or more concession agreements in lieu of, or in addition to, commercial tour activity permits. It is also evaluating the potential benefit of entering into an agreement with another public agency to manage commercial tour activities and transportation of passengers for hire within the UH Management Areas and allow such agreements to be in lieu of, or in addition to, written permits or concession agreements for such purposes. Finally, it is evaluating the desirability and implications of adjusting the fees that are paid to UH by commercial tour operators.

Thereafter, CMS will review the commercial tour permitting process at regular intervals to assess necessary or beneficial changes. Information including permit violations or commercial tour operations impacts to resources will be considered during the review process.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Reference the Maunakea Administrative Rules and illustrate how the permitting process will be used to manage and oversee commercial tours.

7.4.10 ACT-10: PROVIDE INPUT ON FILM PERMITS

As discussed in Section 3.4.2.10 of the 2021 OAR, HAR § 20-26-65 requires a permit for commercial video, digital, film, still photography, or any other visual and audio recordings within

the UH Management Areas. These permits are issued by the Hawai‘i Film Office in the State of Hawai‘i Department of Business, Economic Development & Tourism (DBEDT) following receipt of a CMS recommendation to approve (with applicable conditions) or deny the permit. UH does not promote Maunakea as a tourist destination. This sentiment is repeated by the Film Office, which also informs applicants that Maunakea is not open-access to all filming and that specific approval is required for commercial filming.

Since January 2020, when HAR § 20-26-65 took effect, CMS staff have been available to review applications for film permits that were received, continuing procedures that had formerly been handled by their predecessors at OMKM.³¹ Depending on the nature, scope and potential impacts of a particular application, CMS seeks input from KKM and MKMB. Standard and specific conditions apply to approved film requests, among them the following: (i) filming activity must be adhered to as approved; (ii) a property representative must accompany film crew for the duration of filming on the premises; and (iii) filming after dark with the use of artificial illumination is prohibited.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Clarify that UH’s input on film permits is now included in the Maunakea Administrative Rules and that UH has standard and specific conditions, which UH has developed in coordination with the astronomy facilities and resource specialists.

7.4.11 ACT-12: VET RESEARCH AND SPECIAL USE PROPOSALS & OVERSEE PERMITS

Section 3.4.2.12 of the 2021 OAR addresses UH’s oversight of research permits.³² Specifically, it notes that HAR § 20-26-62 fully implements the kinds of controls over research that the CMP calls for. HAR § 20-26-63 provides similar controls over other “special use” activities. These provisions:

- Allow UH to issue permits to parties wishing to engage in scientific, educational, management, or other activities otherwise prohibited by the rules.
- Require that applications for research or special use permits adequately describe the planned activity and submit the application well in advance of the date of the intended activity.
- Provide that applications for research or special use permits be carefully evaluated. UH will seek input from the advisory groups (e.g., KKM, EC, and MKMB), as appropriate, as part of their evaluation. Overall, all proposals will be evaluated for their consistency with the 2022 Master Plan, the CMP, and the Maunakea Administrative Rules.

In addition to the process discussed here and in the Maunakea Administrative Rules, those proposing research must consider the proposal review process in the 2022 Master Plan if their proposal involves a land use per the Conservation District rules.

Generally, in its review of research proposals, UH: (i) encourages proposers to utilize remote-sensing whenever feasible; (ii) restricts projects (excluding mitigation projects) that disturb natural

³¹ The travel and workplace restrictions that have been in place during that time due to the pandemic limited filming activity to the point where only eight (8) film application requests were received, a fraction of the number that were received in the preceding non-pandemic years.

³² “Research” may or may not involve a “land use” in the Conservation District. See the 2022 Master Plan for more guidance concerning land uses. If it does involve a land use, then additional permits and approvals may be required.

habitat to non-sensitive areas whenever possible; *(iii)* requires that disturbed habitat be returned to original (or improved) condition upon project completion based on an approved restoration plan for sites and access routes; *(iv)* implements best management practices and not emit (or, at minimum, control) light, dust, and radio emissions; *(v)* requires that research projects provide, at no cost to UH, their raw data, “grey literature” products, and/or published papers; and *(vi)* encourages researchers to carry out their work in a way that eliminates or reduces any impacts to resources.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Expanded this action to include both research and special use permits for consistency with the Maunakea Administrative Rules.

CHAPTER 8 PERMITTING AND ENFORCEMENT

8.1 INTRODUCTION

Section 7.2.2 of the 2009 CMP addresses the permitting and enforcement that is needed to be proper stewards of Maunakea. UH took a key step forward in implementing these provisions with the adoption the Maunakea Administrative Rules. This chapter focuses on ensuring there is knowledge of, compliance with, and enforcement of applicable rules, regulations, and permit conditions. Information concerning the current status of permitting and enforcement can be found in Section 3.5 of the 2021 OAR (Appendix A).

8.2 DESIRED OUTCOME

The “desired outcome” with respect to permitting and enforcement is to:

Achieve compliance with existing and any new guidelines and regulations designed to manage and minimize human impacts, to preserve and protect Maunakea’s resources.

8.3 NEED

Permitting and enforcement are essential tools for regulating activities and reducing their impacts on the resources. Compliance with all federal, state, and local laws (not the least of which is the Maunakea Administrative Rules) must be monitored and enforced by appropriate entities with jurisdiction. Likewise, compliance with the terms and conditions of commercial tour permits, research permits, special use permits, film permits, Conservation District Use Permits, and other permits or approvals must be monitored and enforced. Personnel knowledgeable in these subjects must be retained to work in UH Management Areas to monitor, enforce, and ensure adequate protection of resources.

8.4 MANAGEMENT ACTIONS

As discussed in Section 3.5 of the 2021 OAR, six of the eight CMP management actions related to permitting and enforcement are ongoing. Only management actions P-3 and P-6, which were related to rule-making, are complete (CHAPTER 2 of this document). The ongoing management actions are listed in Table 8.1, and the nature of the work that is continuing is summarized in Sections 8.4.1 through 8.4.6.

Table 8.1 Ongoing Management Actions Related to Permitting and Enforcement

| Mgmt. Action | LAWS AND REGULATIONS | Discussion |
|--|---|------------|
| LAWS AND REGULATIONS | | |
| P-1 | Comply with all applicable federal, state, and local laws, regulations, and permit conditions related to activities in the UH Management Areas. | 8.4.1 |
| P-2 | Strengthen CMP implementation by recommending that compliance with the CMP be a condition of permits and agreements. | 8.4.2 |
| P-4 | Educate management staff and those working on the mountain about applicable rules, CMP management actions, and permit requirements. | 8.4.3 |
| ENFORCEMENT | | |
| P-5 | Continue coordinating with other agencies on enforcement needs. | 8.4.4 |
| P-7 | Periodically review facility compliance with Conservation District Use Permits. | 8.4.5 |
| P-8 | Enforce conditions contained in permits issued under the Maunakea Administrative Rules. | 8.4.6 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. Source: Adapted from the 2021 OAR, Table 3.14. | | |

8.4.1 P-1: COMPLY WITH APPLICABLE LAWS, REGULATIONS, AND PERMIT CONDITIONS

As discussed in Section 3.5.2.1 of the 2021 OAR, responsibility for complying with applicable statutes and regulations continues to be the responsibility of everyone who enters the UH Maunakea Lands. On the Federal level these include, but are not limited to, such things as the Clean Air Act (42 U.S.C. 7401 et seq.), the Clean Water Act (33 U.S.C. 1251 et seq.), the Coastal Zone Management Act (16 USC §145 et seq.), the Endangered Species Act (16 USC §1531 et seq.), the National Environmental Policy Act (42 USC §4321 et seq.), and Section 106 of the National Historic Preservation Act, Public Law 89-665, as amended. On the State level, they include, but are not limited to, HRS Chapter 183C, Conservation District (HAR Chapter 13-5, “Conservation District Rules”), HRS Chapter 205A, Hawai‘i’s Coastal Zone Management Program, Maunakea Administrative Rules, HAR Chapter 13-209, “Natural Area Reserves System,” and HRS Chapter 6E, “Historic Preservation.”

As discussed in P-7 (Section 8.4.5), CMS will periodically review facility compliance with CDUP terms to assist DLNR-OCCL. As discussed in ACT-3 (Section 7.4.3), UH will implement and enforce the Maunakea Administrative Rules. As discussed in P-8 (Section 8.4.6), CMS will monitor compliance with permits issued under the Maunakea Administrative Rules.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time. References to the Maunakea Administrative Rules were added.

8.4.2 P-2: STRENGTHEN CMP IMPLEMENTATION THROUGH PERMIT AND AGREEMENT CONDITIONS

UH will implement this management action by: (i) requiring project proposals to include a summary description and/or plan showing how the proposer would comply with CMP management actions relevant to the proposal,³³ and (ii) advocating that compliance with the CMP

³³ Per the 2022 Master Plan, this is also a criteria when UH considers if proposed land uses are appropriate for the UH Maunakea Lands.

be a condition of approval permits issued (e.g., CDUPs issued by BLNR, and permits issued by UH under the Maunakea Administrative Rules). Additionally, UH will advocate for similar conditions to be incorporated in future subleases and other agreements it enters, as appropriate.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been expanded to specify that CMP compliance should also be a condition of permits issued under the Maunakea Administrative Rules.

8.4.3 P-4: PROMOTE MANAGER AND PERMITTEE AWARENESS OF APPLICABLE RULES & PERMIT REQUIREMENTS

As discussed in Section 3.5.2.4 of the 2021 OAR, all UH personnel with the authority to make significant decisions concerning activities on Maunakea are informed of the rules and permit requirements applicable to their areas of responsibility when they assume their positions and are kept current through periodic communiques from CMS. Similarly, UH provides an overview and detailed information regarding the Maunakea Administrative Rules and applicable permit conditions to sublessees, permittees, and their staff at new-project start-up meetings, during periodic orientations (Section 5.4.3.1), and other events. CMS will continue to implement these procedures.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

8.4.4 P-5: COORDINATE ENFORCEMENT EFFORTS WITH OTHER AGENCIES

As discussed in Section 3.5.2.5 of the 2021 OAR, UH actively coordinates with other agencies regarding enforcement of the rules and regulations that are applicable within the UH Management Areas and on immediately adjacent lands. This is part of the larger coordination effort discussed in Section 5.4.2. UH will continue to work with other agencies to achieve coordinated and consistent guidelines for access, activities, and use. Importantly, this coordination includes having entered into a formal “Cooperative Agreement” for efforts in the Mauna Kea Ice Age NAR with DLNR. Finally, UH will continue to coordinate its enforcement activities and share Ranger reports with other entities (e.g., NAR, DOFAW, and USFWS) on a timely basis in accordance with agreements and their requests.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Recognize that UH has entered an agreement with the NAR and established relationships with enforcement entities. Refer to other important management actions related to coordination.

8.4.5 P-7: REVIEW FACILITY COMPLIANCE WITH CDUPS

As discussed in Section 3.5.2.7 of the 2021 OAR, UH has developed a protocol for the Rangers to conduct biennial inspections of all the facilities within the UH Management Areas for which CDUP conditions exist. These twice-yearly inspections will continue. The Rangers will confirm that permit conditions and sublease terms are being met during their inspections. CMS will submit Ranger reports summarizing the inspections to DLNR as part of its annual reporting; however,

CMS will inform DLNR within 30 days if known or suspected non-compliance or violations are encountered by the Rangers during the inspections and they cannot be corrected promptly. This monitoring promotes responsible stewardship, helps minimize the potential for damage to Maunakea, and allows UH to detect and report infractions to DLNR.

During these inspections the Rangers will also ask the operators to confirm that the facilities are complying with applicable laws and regulations, including those listed in Section 8.4.1, and other provisions of the CMP. This assessment will cover a wide range of topics, including, but not limited to, evaluating if the facilities are:

- Properly storing hazardous materials, not storing unnecessary quantities of hazardous materials, and maintaining appropriate spill response equipment and materials.
- Adhering to manufacturer's maintenance and clean-out schedules and permit conditions related to their individual wastewater systems.
- Maintaining all exterior trash cans and dumpsters, if any, with effective lid closure mechanisms designed to withstand high winds.

The Rangers will also ask facility operators about other compliance issues. If any are identified, the Rangers will note this in their reports and request that the operators provide information directly to CMS. If there are still-unresolved compliance issues, CMS will follow up with the operators as appropriate to ensure that compliance issues are resolved in a timely fashion in accordance with applicable CMP management actions, permit conditions, and/or sublease terms.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action has been broadened to include items beyond CDUP conditions because CMS advisory groups and the public have indicated that they are concerned about facility compliance with other requirements and CMP management actions.

8.4.6 P-8: ENFORCE CONDITIONS CONTAINED IN UH-ISSUED PERMITS

As discussed in Section 3.5.2.8 of the 2021 OAR, the Rangers monitor activities within the UH Management Areas daily, recording pertinent data regarding commercial tour activity and providing real-time feedback to operators when activity is observed that appears to be inappropriate or inconsistent with tour permit conditions. The Rangers will continue to do this.

The Rangers will also continue to monitor other permitted activities, such as research, special use, commercial tour, and filming. Should the Rangers observe permit violations, they will document it and provide real-time feedback to permit holders so that violations can be corrected immediately. Should permitted activities continue to be conducted in a manner inconsistent with permit conditions following Ranger warnings, UH may implement one or more sanctions pursuant to the Maunakea Administrative Rules, including expelling and barring the violator from the UH Management Areas; fining the violator; and revoking the permit.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Discussion has been expanded to include all permits issued under the Maunakea Administrative Rules.

CHAPTER 9 INFRASTRUCTURE AND MAINTENANCE

9.1 INTRODUCTION

Section 7.3.1 of the 2009 CMP provided guidance concerning infrastructure and maintenance within the UH Maunakea Lands, ranging from basic tasks (e.g., painting buildings) to more complex and involved tasks (e.g., operating/maintaining septic tanks and keeping the roadways in serviceable condition). Activities to maintain the built environment continue and implementing the infrastructure and maintenance (IM) management actions are important to minimize the impact of these activities. Information concerning the current status of infrastructure and maintenance can be found in Section 3.6 of the 2021 OAR (Appendix A).

9.2 DESIRED OUTCOME

The “desired outcome” with respect to managing the built environment is to:

Manage the built environment by implementing an Operations, Monitoring and Maintenance Plan (OMMP) containing specific maintenance strategies and guidelines that will result in minimal disruptions to activities and uses, minimize impacts to the resources, and ensure that permittees remain compliant with their CDUP requirements.

9.3 NEED

The land uses and infrastructure within the UH Maunakea Lands (e.g., astronomy facilities, roads, utilities, signs, etc.) exist within the sensitive cultural landscape and subalpine and alpine ecosystems of Maunakea. UH needs to work closely with the astronomy facility operators and other maintenance personnel to continue existing practices and identify improved strategies to reduce impacts to resources associated with infrastructure and maintenance practices.

Furthermore, the astronomy facilities and UH are required to maintain their facilities and infrastructure in a manner that complies with the terms of their CDUPs, land authorizations, other approvals, and applicable rules and regulations. These agreements and approvals include conditions and provisions to protect the environment. For example, activities must be compliant with applicable historic preservation requirements, permits regarding the operation on individual wastewater systems, and the management of hazardous materials.

9.4 MANAGEMENT ACTIONS

As discussed in Section 3.6 of the 2021 OAR, none of the 14 CMP management actions related to infrastructure and maintenance have been entirely completed. Hence, all are ongoing and are listed in Table 9.1 and detailed in Sections 9.4.1 through 9.4.14.

Table 9.1 Ongoing Infrastructure and Maintenance Management Actions

| Mgmt. Action | Description | Discussion |
|--|--|------------|
| Routine Maintenance | | |
| IM-1 | Implement the <i>Operations, Monitoring, and Maintenance Plan</i> (OMMP) (Office of Mauna Kea Management, February 2017) and update it as appropriate. | 9.4.1 |
| IM-2 | Require maintenance personnel to complete the worker orientation (EO-2). | 9.4.2 |
| IM-3 | Ensure maintenance activities that involve ground disturb disturbance complete a historic preservation review. | 9.4.3 |
| IM-4 | Ensure that maintenance personnel, equipment, and vehicles comply with the <i>Maunakea Invasive Species Management Plan</i> (C. Vanderwoude, February 2015). | 9.4.4 |
| IM-5 | Finalize and implement a Debris Removal, Monitoring and Prevention Plan. | 9.4.5 |
| IM-6 | Finalize and implement an Erosion Inventory and Assessment Plan. | 9.4.6 |
| IM-7 | Collaborate with the Department of Defense to remove military wreckage. | 9.4.7 |
| Infrastructure | | |
| IM-8 | Assess improvements to the Mauna Kea Access Road consistent with the 2022 Master Plan. | 9.4.8 |
| IM-9 | Assess improvements to parking facilities consistent with the 2022 Master Plan. | 9.4.9 |
| IM-10 | Assess improvements to restroom and wastewater facilities consistent with the 2022 Master Plan. | 9.4.10 |
| Sustainable Technologies | | |
| IM-11 | Encourage existing facilities and new development to incorporate sustainable and energy-efficient technologies, whenever possible. | 9.4.11 |
| IM-12 | Conduct periodic energy audits and implement recommendations. | 9.4.12 |
| IM-13 | Install locally-based alternative energy sources as opportunities arise. | 9.4.13 |
| IM-14 | Conduct periodic waste minimization audits and implement recommendations. | 9.4.14 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. Source: Adapted from the 2021 OAR, Table 3.15. | | |

9.4.1 IM-1: IMPLEMENT THE OMMP

As discussed in Section 3.6.2.1 of the 2021 OAR, UH completed its *Operations, Monitoring, and Maintenance Plan* (OMMP) (Office of Mauna Kea Management, February 2017) for Maunakea in 2017 and has been implementing it since that time. Consistent with the adopted OMMP and in accordance with its provisions, each astronomy facility and UH will continue to annually submit descriptions of projects and activities it anticipates undertaking over the coming five years (often referred to as “Five-Year Outlooks”). Monitoring of those projects and activities is then accomplished through the CMS’ proposal review process (see 2022 Master Plan) and subsequent tracking, daily Ranger activity reporting, state permitting, and comparison of detailed project proposals with existing 5-year outlooks. The guidelines in the OMMP will be updated periodically as needed to remain consistent with the 2022 Master Plan, changes in the number and type of facilities present in the UH Management Areas, and to reflect the lessons learned during implementation.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that an OMMP has been adopted and is being implemented. In addition, it indicates that, as with other plans, it will be updated using adaptive management protocols into the future.

9.4.2 IM-2: REQUIRE MAINTENANCE WORKER ORIENTATION

As discussed in Section 3.6.2.2 of the 2021 OAR, UH has developed, and requires all persons who are going to work in the UH Maunakea Lands to complete, an educational orientation that informs them of the unique nature of the resources and the kinds of behavior that they need to engage in to protect them. UH will continue to require maintenance workers, whether employed by UH or another entity, comply with management action EO-2 and receive the worker orientation as outlined in Section 5.4.3.1.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

9.4.3 IM-3: ENSURE HISTORIC PRESERVATION REVIEW FOR O&M ACTIVITIES

As discussed in Section 3.6.2.3 of the 2021 OAR, the ordinary daily activities and routine maintenance operations that take place within the UH Management Areas do not affect historic properties and are not subject to historic preservation review. At the same time, certain types of maintenance activities – those that result in ground disturbance where none has occurred previously – do require historic preservation review. UH has, in coordination with DLNR, developed a list that distinguishes between maintenance actions that require no further historic review and those that do require historic review. That list may be updated from time to time in coordination with DLNR. All operations and maintenance (O&M) activities that are not routine in nature and are not on the list of activities that do not require historic preservation review will be identified in the Five-Year Outlooks. The project-specific historic preservation review will occur as part of the proposal review process outlined in the 2022 Master Plan and downstream permitting and approval steps. UH and its sublessees will continue to follow the agreed-upon review and outreach procedures for all their O&M activities.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). The discussion has been expanded to highlight that, as the 2009 CMP suggested and in coordination with DLNR, a list of activities not requiring historic preservation review has been generated. O&M activities not on that list continue to require project-specific historic preservation review.

9.4.4 IM-4: ENSURE O&M ACTIVITIES COMPLY WITH THE ISMP

As described in Section 3.6.2.4 of the 2021 OAR, based on the results of scientific studies that it commissioned, UH developed a set of standard operating procedures (SOPs) regarding the cleaning of vehicles and personal belongings that apply to the passengers, vehicle operators, immediate personal possessions, and any vehicle operating under a permit within the UH Management Areas. These SOPs are part of the *Maunakea Invasive Species Management Plan* (ISMP) (Section 4.4.2). This management action requires that O&M activities fully comply with the ISMP just as new construction activities do.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been adapted to specify that O&M activities comply with the ISMP, which is a more stringent requirement than establishing and using a wash station near Halepōhaku as the 2009 CMP did.

Establishing a wash station near Halepōhaku was considered but it was decided that using a lower elevation wash station was the best approach to ISMP compliance.

9.4.5 IM-5: FINALIZE & IMPLEMENT DEBRIS REMOVAL, MONITORING, AND PREVENTION PLAN

As detailed in Section 3.6.2.5 of the 2021 OAR, OMKM/CMS developed a draft *Debris Removal, Monitoring and Prevention Plan* that contains numerous procedures aimed at maintaining the UH Management Areas in a clean and orderly condition for resource protection. It has been following those procedures since 2001, UH believes the procedures have been effective in achieving the enumerated goals, and UH expects to finalize the plan by the end of 2022. Once finalized, UH will continue to implement the plan and update it as warranted based on lessons learned, monitoring results, changes in the characteristics of debris encountered, or other factors.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that the plan called for has been developed, is being implemented, and will soon be officially adopted. In addition, it indicates that, as with other plans, it will be updated using adaptive management protocols into the future.

9.4.6 IM-6: FINALIZE & IMPLEMENT EROSION CONTROL PLAN

As discussed in Section 3.6.2.6 of the 2021 OAR, OMKM partnered with the UH Hilo Geography Department to initiate a study of surficial geology and cinder cone erosion issues. The purpose of the work was to quantify topographic changes over time relating to natural and anthropogenic disturbance and erosion and to: (i) identify locations of greatest concern for erosion and disturbance; (ii) determine how erosion rates in disturbed areas compare to erosion rates on undisturbed cones; and (iii) determine how these rates compare to other cinder cones globally. In carrying out the work the author assembled baseline high-resolution (< 1 m spatial resolution) imagery and topographic datasets.³⁴ The study results are detailed in the *Maunakea Summit Surficial Geomorphology & Erosion Monitoring Final Report*, which was published on February 8, 2021.

In discussing the conclusions and recommended approaches to addressing erosion issues within the summit area, the report noted the following:

- Erosion at the Maunakea summit is an active and ongoing concern.
- Early road construction activities in the 1960s and 1970s significantly altered natural surface runoff pathways and caused extensive gully along the summit access road, particularly along the Pu‘uwēkiu switchback.
- Those large historic gully features have now largely stabilized because of regular maintenance and road improvements that occurred in 1989-1990, but the culverts that were installed now direct excess surface flow into new locations, causing gully and deposition in areas that were previously undisturbed.

³⁴ Those datasets have been used by others for other research activities and objectives, including producing spatially explicit habitat suitability maps across the summit area for the wēkiu bug and other arthropod species (Stephenson et al. 2017), documenting site stability and change at known archaeological sites, and contributing to other ongoing and new research efforts within the MKSR (Kirkpatrick, 2018; Schorghofer et al. 2018).

- New gullies continue to develop along roadways from large precipitation events, undermining existing infrastructure and presenting challenges. Without continued attention to road maintenance and cinder replenishment efforts, these gullies have the potential for dramatic growth and roadway damage in future storms.
- Continuing these maintenance efforts, which include periodic excavation from zones of cinder accumulation and re-deposition into actively eroding areas, is critical for limiting the growth of incipient gullies and stabilizing undercut surfaces. Without excavation, accumulated cinder eroded from over-steepened slopes will eventually overtop the retaining walls along the Pu‘uwēkiu switchback and deposit onto the road surface. Similarly, without replenishment, undercut road infrastructure will eventually fail.

The *Maunakea Summit Surficial Geomorphology & Erosion Monitoring Final Report* concludes that:

- Additional improvements to the roadways and surface runoff infrastructure to minimize and redirect flow accumulation pathways would help reduce new gully formation and starve existing gullies of the concentrated runoff needed to do further geomorphic work.
- Existing culvert outflow locations will continue to receive surface runoff and sediment, and will remain areas of active geomorphic change and increasing visibility on the landscape.
- Erosion control infrastructure should continue to be maintained and cleared, particularly prior to large storm systems that may generate significant storm runoff.
- It is desirable to establish a regular erosion monitoring program, including an annual inventory report documenting changes, to identify and track areas of concern and help better-manage summit resources.³⁵

As it finalizes the Erosion Control Plan CMS will identify operation, maintenance, repair, and/or improvement work to address the recommendations and conclusions in the report.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action recognizes that a plan is being developed and will be finalized. In addition, it indicates that, as with other plans, it will be updated using adaptive management protocols into the future.

9.4.7 IM-7: COLLABORATE WITH DoD TO REMOVE MILITARY WRECKAGE

Section 3.6.2.7 of the 2021 OAR notes that OMKM has submitted an inventory of all known military aircraft wreckage within the UH Management Areas to the U.S. Department of Defense (DoD) and in collaboration with DoD, OMKM/CMS has prepared a Draft *Military Wreckage Removal Plan*. UH will work with DoD and encourage DoD to finalize the plan, present it as a proposal to UH, have the proposal go through the 2022 Master Plan’s proposal review process, obtain required permits and approvals (including historic preservation review), and then implement the plan.

³⁵ The report notes that the data generated as a result of such a monitoring program would also have utility for other subjects, including wēkiu bug habitat analysis and monitoring, invasive plant species detection, permafrost studies, and decommissioning.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action recognizes preliminary steps have been taken, but it is up to DoD to finalize a plan, obtain approvals, and then implement the plan.

9.4.8 IM-8: ASSESS ROAD IMPROVEMENTS CONSISTENT WITH 2022 MASTER PLAN

Section 3.6.2.8 of the 2021 OAR notes that the road paving issues discussed in the 2009 CMP have been considered since the CMP was adopted, and the outcomes of those considerations have been incorporated into UH's 2022 Master Plan. It confirms that after consulting with engineers, archaeologists, and other professionals, UH has determined that it will not pursue paving the entire unpaved portion of the Mauna Kea Access Road at this time.

UH will continue to assess the need for roadway improvements on a regular basis. The assessment will consider several variables, including access management, the types of vehicles using the road, the O&M effort that is required to keep the existing roadway functional, and the cost of making capital improvements. The types of improvements that it will continue to consider include those related to drainage, safety, and traffic flow. If improvements are deemed appropriate, they will be proposed as projects and approvals will be sought in accordance with the processes outlined in the 2022 Master Plan.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that "land uses," as defined in the Conservation District Rules, including improvements to a road, are correctly addressed in the Master Plan. The action now indicates UH will continue to assess potential improvements; implementation of resulting proposals will follow the 2022 Master Plan.

9.4.9 IM-9: ASSESS PARKING IMPROVEMENTS CONSISTENT WITH 2022 MASTER PLAN

As discussed in detail in Section 4.5.1.9 of the 2021 OAR, the parking and pullout issues discussed in the 2009 CMP have been considered since CMP adoption and the outcomes of those considerations have either been implemented or incorporated into UH's 2022 Master Plan. Going forward, UH will continue to assess the need for parking improvements based on several variables, including access management, vehicle types, and capital improvement costs. Improvements that will continue to be considered include signage and parking infrastructure at locations within the MKSR as astronomy facilities are decommissioned. If improvements are deemed appropriate, they will be proposed as land uses and requests for approval will be handled in accordance with the processes outlined in the 2022 Master Plan.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that "land uses," as defined in the Conservation District Rules, including parking improvements, are appropriately addressed in the Master Plan. The action now indicates UH will continue to assess potential improvements; implementation of resulting proposals will follow the 2022 Master Plan.

9.4.10 IM-10: ASSESS RESTROOM AND WASTEWATER IMPROVEMENTS CONSISTENT WITH 2022 MASTER PLAN

As stated in Section 3.6.2.10 of the 2021 OAR, because the extent to which additional public restroom facilities are needed in the MKSR and Halepōhaku is primarily a facility issue (and is strongly influenced by the measures that are implemented to manage access), it is properly being dealt with in the 2022 Master Plan. However, it can be said that the results of the analyses of this topic that have been done to date indicate that the number of likely visitors to the summit area will remain at a level where improved restroom facilities in the MKSR are appropriate. CMS is currently studying the most appropriate technologies and locations for these facilities. While not entirely the responsibility of UH, it is worth noting that all the astronomy facilities that continue operation beyond 2033 will use zero-discharge wastewater systems.

Improvements that are deemed appropriate and the zero-discharge conversions will be proposed as land uses and comply with the processes outlined in the 2022 Master Plan.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that “land uses,” as defined in the Conservation District Rules, including restrooms and wastewater improvements, are correctly addressed in the 2022 Master Plan. The action now indicates UH will continue to assess potential improvements; implementation of resulting proposals will follow the 2022 Master Plan.

9.4.11 IM-11: ENCOURAGE SUSTAINABLE AND ENERGY-EFFICIENT TECHNOLOGIES

As described in detail in Section 3.6.2.11 of the 2021 OAR, UH is doing its utmost to encourage existing and new facilities within the UH Management Areas to maximize their use of sustainable, energy-efficient technologies. Prime examples of this include its formal “Sustainability Policy,” which aims to achieve carbon neutrality, zero waste, and local food self-sufficiency, and Executive Policy 4.202 concerning “System Sustainability.”

UH will continue to encourage designers to use sustainable and energy-efficient technologies for both existing and new facilities. Principal goals for this effort include:

- Reducing potable water use (e.g., at Halepōhaku separate gray wastewater from sewage waste and use gray water for habitat restoration irrigation).
- Reducing energy use (e.g., increase efficiency of HVAC systems, solar water heaters).
- Reducing the need for human operation and maintenance through programs for remote viewing and robotic operation.

Consideration of sustainable and energy-efficient technologies shall be encouraged through the Five-Year Outlook process for existing facilities and the proposal review process for all new facilities.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been adapted to provide a specific goal and identify the process by which these technologies will be encouraged.

9.4.12 IM-12: CONDUCT ENERGY AUDITS AND IMPLEMENT RECOMMENDATIONS

As discussed in Section 3.6.2.12 of the 2021 OAR, UH has already completed energy audits for all its facilities on Maunakea and it has used the information obtained through these audits to develop measures that reduce energy usage at its facilities on Maunakea. CMS will continue to explore the potential for additional changes to UH facilities and encourage others to conduct audits to identify measures that would further reduce energy consumption. Similar to IM-11, this will continue to be done and encouraged for both existing and new facilities through the Five-Year Outlook process for existing facilities and the proposal review process for all facilities.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been adapted to identify the process by which energy audits will be encouraged.

9.4.13 IM-13: INSTALL LOCALLY-BASED ALTERNATIVE ENERGY SOURCES AS OPPORTUNITIES ARISE

As outlined in Section 3.6.2.13 of the 2021 OAR, electricity produced by alternative energy sources is being substituted for electricity from fossil fuel-fired generators when opportunities arise. This will continue and additional sustainable generation possibilities will be identified and evaluated. When analyses indicate that they are beneficial, such equipment will be installed by UH, the astronomy facility operators, and others. In exploring the potential for additional sustainable energy use, UH will continue to consider both on-site sources and participation in renewable energy generation elsewhere equivalent to the amount used on Maunakea. Similar to IM-11, this will continue to be done and encouraged for both existing and new facilities through the Five-Year Outlook process for existing facilities and the proposal review process for all facilities.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been adapted to identify the process by which the installation of alternative energy sources will be encouraged.

9.4.14 IM-14: CONDUCT WASTE AUDITS AND IMPLEMENT RECOMMENDATIONS

As discussed in Section 3.6.2.14 of the 2021 OAR, CMS is continuing to encourage the managers of its sublessees' facilities to conduct waste minimization studies and implement audit recommendations, when feasible. The information it receives from regular inspection reports and informal discussions that CMS staff members have had with users indicate a downward trend in the use of hazardous materials on Maunakea. Similar to IM-11, this will continue to be done and encouraged for both existing and new facilities through the Five-Year Outlook process for existing facilities and the proposal review process for all facilities.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been adapted to identify the process by which waste audits will be encouraged.

CHAPTER 10 CONSTRUCTION GUIDELINES

10.1 INTRODUCTION

Section 7.3.2 of the 2009 CMP provides information and management actions focused on minimizing the direct and indirect impacts that construction activities related to large projects, including new buildings, site recycling, demolition, and site restoration, have on resources. The CMP construction guidelines supplement and complement, rather than replace, guidelines and mandates in other governing approvals and requirements so that these issues are considered early in the planning and development process. Information concerning the current status of the construction guidelines can be found in Section 3.7 of the 2021 OAR (Appendix A).

10.2 DESIRED OUTCOME

The “desired outcome” with respect to construction is to:

Minimize adverse impacts to resources during all phases of construction through use of innovative best management practices.

10.3 NEED

There is a need to implement best management practices (BMPs), which can consist of specifying the use of certain types of products at select location or identifying guidelines and procedures to be followed, to avoid or minimize adverse effects to resources during construction activities. Other important needs include: (i) gathering information needed to ascertain which BMPs are working and which are not; (ii) ensuring information obtained about Maunakea’s resources during construction projects (e.g., subsurface conditions) is shared with UH and entered into databases; (iii) having an independent construction monitor present during construction activities; and (iv) monitoring construction work to ensure that contractors comply with permit conditions.

10.4 MANAGEMENT ACTIONS

As shown in Table 10.1, all nine of the CMP management actions related to construction guidelines are “ongoing”, meaning that guidelines and procedures are in place and are being implemented. The nature of the work that is continuing is summarized in Sections 10.4.1 through 10.4.9.

Table 10.1 Ongoing Management Actions Related to Construction Guidelines

| Mgmt. Action | Description | Discussion |
|--|--|------------|
| GENERAL REQUIREMENTS | | |
| C-1 | Require an independent construction monitor who has oversight and authority to ensure that all aspects of construction comply with guidelines and permit requirements. | 10.4.1 |
| BEST MANAGEMENT PRACTICES | | |
| C-2 | Require implementation of a UH-approved Best Management Practices Plan. | 10.4.2 |
| C-3 | Require implementation of a UH-approved Rock Movement Plan, when appropriate. | 10.4.3 |
| C-4 | Require contractors to provide information from construction activities to UH for input into databases. | 10.4.4 |
| C-5 | Require on-site monitors (e.g., archaeologist, cultural resources specialist, invasive species specialist) during construction, as determined by the appropriate agencies. | 10.4.5 |
| C-6 | Implement a SHPD-approved Archaeological Monitoring Plan, when appropriate. | 10.4.6 |
| C-7 | Educate construction personnel regarding the cultural landscape. | 10.4.7 |
| C-8 | Educate construction personnel regarding natural resources. | 10.4.8 |
| C-9 | Inspect construction equipment and materials for invasive species. | 10.4.9 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. Source: Adapted from the 2021 OAR, Table 3.17. | | |

10.4.1 C-1: REQUIRE AN INDEPENDENT CONSTRUCTION MONITOR

As discussed in Section 3.7.2.1 of the 2021 OAR, most of the construction projects that have been undertaken since the CMP was adopted have been small and did not involve the kind of ground-disturbing work that would require an independent construction monitor (ICM). However, an ICM has been present for two larger undertakings (*i*) the improvements made to VIS parking and other facilities at Halepōhaku, and (*ii*) the initial sitework for the TMT project.

UH will continue to require an ICM for proposals considered Type C per the process outlined in the 2022 Master Plan and may require an ICM for other proposal types when deemed appropriate. The ICM will:

- Be approved by the CMS Executive Director.
- Be knowledgeable in construction management and Maunakea’s conditions and resources.
- Be funded by the project owner.
- Be present at the worksite as the ICM deem necessary and be readily available during all periods of construction (or deconstruction and restoration in the case of decommissioning projects), including, but not limited to: (*i*) delivery of construction materials to the project site or staging areas within the UH Management Areas; (*ii*) establishment of BMPs; and (*iii*) ground-disturbing activities.
- Monitor compliance with plans and specifications approved by UH (e.g., the BMP Plan), applicable rules and regulations, issued permits, and sublease and other agreement terms.
- Prepare weekly reports that are shared with UH and the project owner; the reports may also be shared with others, as deemed appropriate to the project.

The ICM may be a UH employee, a contractor or consultant, or other party agreeable to CMS Executive Director. The ICM cannot be an employee of the project owner or the project owner’s prime contractor.

The ICM will have the authority to order that any or all construction activity within the UH Management Areas cease if and when, in the ICM's judgment, (i) there has been a violation of the terms or conditions of a permit that warrants cessation of construction activities or (ii) that continued construction activity will unduly harm natural or cultural resources (provided that the ICM's order to cease construction activities shall be for a period not to exceed seventy-two (72) hours for each incident). All orders to cease construction issued by the ICM shall be immediately reported to the Chairperson of BLNR and a designated UH representative.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Clarifications regarding the qualifications and responsibilities of the ICM were added to address uncertainties identified during recent projects.

10.4.2 C-2: REQUIRE A BEST MANAGEMENT PRACTICES PLAN FOR CONSTRUCTION

As outlined in Section 3.7.2.2 of the 2021 OAR, UH requires a BMP Plan for all construction projects. UH will continue to require that all projects prepare a BMP Plan, provide it to UH for review, and receive UH's acceptance of the plan prior to proceeding with construction activities within the UH Management Areas.

Project proposers bear all costs of preparing and implementing their BMP Plans. BMPs must:

- Incorporate applicable plans, guidelines, and SOPs that emanate from other CMP management actions (e.g., Maunakea Invasive Species Management Plan).
- Address all applicable C-# management actions.
- Capture all measures outlined in disclosure documents (e.g., EA or EIS) and permit applications.
- Where appropriate, include measures to minimize: (i) construction time (for example, by scheduling construction work so that, to the extent possible, the activity schedule includes concurrent work); (ii) water use; (iii) traffic; (iv) use and transport of toxic materials, including petrochemicals; (v) ground disturbance, graded area, and dust generation; (vi) noise; and (vii) threats related to invasive species.

UH will continue to assess the effectiveness of BMPs, based on ICM reports and other construction documentation.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time. Nevertheless, references to plans and guidelines developed since 2009 that should be considered in preparation of a BMP Plan were added.

10.4.3 C-3: REQUIRE A ROCK MANAGEMENT PLAN, WHEN APPROPRIATE

As described in Section 3.7.2.3 of the 2021 OAR, UH has and will continue to require a Rock Management Plan for all construction (including new development, maintenance activities, or site decommissioning) that involves excavation, grading, or other movement of rock material. The implementation of these plans has and should: (i) continue to minimize displacement of cinder during construction; (ii) result in cinder being stockpiled (so that it can be used for future

restoration projects) in a predetermined location rather than simply pushed out of the way, down-slope; and (iii) eliminate side-casting of cinder or other materials into wēkiu bug habitat.

Rock Management Plans must be prepared by the project owner and reviewed and approved by UH prior to the project proceeding. The plans are required to:

- Document the location, type, and volume of source material and include separate discussions of native material (divided into cinder and other rock types) and imported material.
- Detail the extraction and movement process.
- Describe where excess native rock (cinder or otherwise) will be placed within the UH Management Areas. The designated location(s) must be included in the project area designated in permit applications and considered in the project's impact analysis. The location should also be accessible and previously disturbed.
- Address how the handling and storage of native rock will aid future site restoration, if applicable.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time. Nevertheless, clarifications regarding the intent and contents of a Rock Management Plan were added to address uncertainty identified during recent projects.

10.4.4 C-4: REQUIRE CONTRACTORS TO PROVIDE INFORMATION/DOCUMENTATION FOR ACTIVITIES

As discussed in Section 3.7.2.4 of the 2021 OAR, UH has been requiring contractors who perform work within the UH Management Areas to submit the required information, and it has maintained hard copy and/or electronic versions of that information in its files. It will continue to require that contractors submit: (i) BMP inspection forms; (ii) field logs and photographs; (iii) laboratory analysis, and (iv) other construction documentation that contain information on the biotic and abiotic environmental variables at the project site. Each project's BMP Plan (Section 10.4.2) must include a reporting section that provides a list of information likely to be produced and specify the method and format in which it will be provided to UH.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time. Nevertheless, references to a reporting section in a project's BMP Plan was added to avoid delays in management action compliance.

10.4.5 C-5: REQUIRE ON-SITE MONITORING DURING CONSTRUCTION

As reported in Section 3.7.2.5 of the 2021 OAR, the need for on-site construction monitors is determined by regulatory agencies (e.g., SHPD, DLNR, etc.) and the monitoring is focused primarily on those activities involving earth movement or disturbance. UH will continue to ensure that experts approved by the appropriate agency will monitor project activities as outlined in agency-approved monitoring plans. CMS anticipates that the following types of monitoring plans may be appropriate, depending on the project's scope and characteristics:

- Archaeological monitor who follows a project-specific Archaeological Monitoring Plan (AMP) that has been prepared by the project and approved by SHPD (see Section 10.4.6 for additional details). The archaeological monitor must work for a firm or be a scholar or organization that is identified by SHPD to be permitted to provide archaeological services in the State of Hawai‘i.
- Cultural monitor who follows a project-specific Cultural Monitoring Plan that has been prepared by the project and approved by UH. The individual or firm providing cultural monitoring services will also be approved by UH.
- Invasive species monitor who follows a project-specific Invasive Species Monitoring Plan, prepared by the project, reviewed by UH and DLNR, and approved by UH.

These project-specific monitoring plans will be part of each project’s BMP Plan (Section 10.4.2). The entities that implement these plans are identified and funded by the project proponents but are subject to the approvals outlined above, and, where applicable, must meet the qualification requirements of the appropriate agency (e.g., SHPD) as identified above.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Greater specificity has been added to address uncertainty regarding the types of monitors, the plans they will follow, and the approval of the monitor and plan.

10.4.6 C-6: REQUIRE AN ARCHAEOLOGICAL MONITORING PLAN

As stated in Section 3.7.2.6 of the 2021 OAR, archaeological monitoring has been conducted in accordance with SHPD guidance for all projects involving ground disturbance that have been initiated since the 2009 CMP was adopted. The project proponent will, in consultation with SHPD, establish whether archaeological monitoring is required during the project. If it is required, the project proponent will prepare an AMP and obtain SHPD approval of the plan prior to the start of any ground-disturbing work. Should any resources be encountered, the project proponent will strictly follow the provisions of the AMP.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

10.4.7 C-7: EDUCATE CONSTRUCTION WORKERS REGARDING HISTORICAL AND CULTURAL SIGNIFICANCE

Prior to entering the UH Management Areas, all construction personnel are informed of Maunakea’s historical and cultural significance. That is done by: (i) successfully completing the same worker orientation program as astronomy facility employees, as outlined in CMP management action EO-2 (Section 5.4.3.1) and (ii) participating in a project kickoff meeting, or similar event, at which project-specific information, including information about the resources and cultural practices in the project area, are shared. Each BMP Plan (see Section 10.4.2) will include a section regarding how this education will be accomplished.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action

has been adapted to specify the process that has been used since the CMP was approved to educate construction staff regarding historic and cultural aspects of their project area. It also now incorporates references to the orientation developed for workers on Maunakea.

10.4.8 C-8: EDUCATE CONSTRUCTION WORKERS REGARDING ENVIRONMENT, ECOLOGY, AND NATURAL RESOURCES

Prior to entering the UH Management Areas, all construction personnel are informed of Maunakea's environment, ecology, and natural resources. That is done by: (i) successfully completing the same worker orientation program as astronomy facility employees, as outlined in CMP management action EO-2 (Section 5.4.3.1) and (ii) participating in a project kickoff meeting, or similar event, at which project-specific information, including information about the resources and cultural practices in the project area, are shared. Each BMP Plan (see Section 10.4.2) will include a section regarding how this education will be accomplished.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been adapted to specify the process that has been used since the CMP was approved to educate construction staff regarding natural resources in their project area. It also now incorporates references to the orientation developed for workers on Maunakea.

10.4.9 C-9: INSPECT CONSTRUCTION EQUIPMENT AND MATERIALS

As discussed in Section 3.7.2.9 of the 2021 OAR, UH is fully implementing inspections and controls called for in this measure. This will continue and be part of the required project-specific Invasive Species Management Plan referenced in Section 4.4.2 and will be consistent with the Maunakea Invasive Species Management Plan (C. Vanderwoude, February 2015), including the inspection of construction equipment and materials. The person or firm conducting the monitoring and inspections will be a trained biologist, selected and funded by the project, and approved by UH and DLNR, as outlined in Section 10.4.5.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action has been adapted to specify the process that has successfully been employed since the Maunakea Invasive Species Management Plan was approved and implemented.

CHAPTER 11 SITE RECYCLING, DECOMMISSIONING, DEMOLITION, & RESTORATION

11.1 INTRODUCTION

Section 7.3.3 of the 2009 CMP provides general guidance on-site recycling, decommissioning, demolition, and restoration for astronomy facilities in the UH Management Areas. Additional procedural guidance for demolition and site restoration is detailed in the *Site Decommissioning Plan Decommissioning Plan for Mauna Kea Observatories* (Sustainable Resources Group International, Inc., January 2010b). Information concerning the current status of site recycling and decommissioning can be found in Section 3.8 of the 2021 OAR (Appendix A).

11.2 DESIRED OUTCOME

The “desired outcome” with respect to site recycling, decommissioning, demolition, and restoration is:

To the extent possible, reduce the area disturbed by physical structures within the UH Management Areas by upgrading and reusing buildings and equipment at existing locations, removing obsolete facilities, and restoring impacted sites to pre-disturbed condition.

11.3 NEED

Each astronomy facility must identify what course of action they will pursue when the life expectancy of their facility is reached or when their lease/sublease expires. While UH will be responsible for overseeing compliance with the CMP, compliance with this section requires a collaborative effort between UH, DLNR, and the astronomy facility operators.

11.4 MANAGEMENT ACTIONS

As discussed in Section 3.8 of the 2021 OAR, the three CMP management actions related to site recycling, demolition, & restoration are “ongoing,” meaning that guidelines and procedures are in place and are being implemented. The management actions are listed in Table 11.1 and discussed in Sections 11.4.1 and 11.4.2.

Table 11.1 Ongoing Site Recycling, Decommissioning, Demolition, and Restoration Management Actions

| Mgmt. Action | Description | Discussion |
|--|---|-------------------|
| SR-1 | Require astronomy facilities to develop plans for reuse or removal in accordance with the <i>Decommissioning Plan for the Mauna Kea Observatories</i> (Sustainable Resources Group International, Inc., January 2010b). | 11.4.1 |
| SR-2 | Require astronomy facilities to develop plans for site restoration in accordance with the <i>Decommissioning Plan for the Mauna Kea Observatories</i> (Sustainable Resources Group International, Inc., January 2010b). | 11.4.1 |
| SR-3 | Require future astronomy facilities to consider decommissioning during project planning. | 11.4.2 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | | |
| Source: Adapted from the 2021 OAR, Table 3.18. | | |

11.4.1 SR-1 AND SR-2: REQUIRE DECOMMISSIONING PLANNING

As discussed in detail in Section 3.8.2.1 of the 2021 OAR, UH is fully implementing the *Decommissioning Plan for the Mauna Kea Observatories* (Decommissioning Plan) (Sustainable Resources Group International, Inc., January 2010b). As detailed in Section 4.1.2 of the 2022 Master Plan, UH has committed to there being no more than nine operating astronomy facilities in the MKSR by the end of 2033.

As of the first quarter of 2022, there are 13 astronomy facilities present and a 14th astronomy facility permitted in the MKSR. Two of the 13 existing astronomical facilities (Hōkū Kea and CSO) have substantially completed the planning process specified in the Decommissioning Plan but have not obtained all the approvals needed to begin physically removing their facilities and restoring their sites. In addition, for reasons specified in the 2022 Master Plan, UH has notified the operator of the Very Long Baseline Array (VLBA) that its sublease will not be renewed and it will need to complete the decommissioning process before the end of 2033. Depending upon what transpires on Astronomy Site 13 (the permitted site for the TMT project), UH is committed to decommissioning either one or two additional astronomy facilities by the end of 2033 so that there will be no more than nine operating astronomy facilities in the MKSR by that time.

UH will continue to implement the procedures in outlined in the Decommissioning Plan, updating them as appropriate based on lessons learned during the decommissioning of Hōkū Kea and CSO, the first two astronomy facilities to decommission. CMS anticipates that they will update the Decommissioning Plan no later than mid-2024, soon after Hōkū Kea and CSO complete their decommissioning. The updated Decommissioning Plan will be in effect before operators of other facilities (e.g., VLBA and at least one other) need to begin preparing their decommissioning plans.³⁷

The preparation of the Decommissioning Plan was a condition of BLNR's approval of the CMP in 2009 and BLNR confirmed that UH successfully complied with that condition in 2010. As a result, the Decommissioning Plan has been referred to as a "subplan" of the CMP. Going forward the Decommissioning Plan, which provides detailed guidance regarding the SR-# management actions, will have the same standing as other plans that provide detailed guidance on the implementation of other management actions (e.g., the ISMP, MEOP, OMMP, etc.). The process

³⁷ Updating of the Decommissioning Plan may commence prior to Hōkū Kea and CSO receiving all their approvals if those approvals are delayed by contested case requests or other challenges.

that CMS will follow in updating the Decommissioning Plan will be like the process UH follows when it updates other implementation plans/guidelines identified in this document. UH anticipates that this will entail the following steps: (i) preparing an updated document that reflects the lessons learned from the two decommissioning projects that are now underway in coordination with relevant agencies (e.g., OCCL, NAR, DLNR Land Division, SHPD, etc.); (ii) seeking input from the community, its advisory groups (e.g., MKMB, KKM, EC), and the Native Hawaiian community; (iii) revising its decommissioning procedures in response to the input and advice it receives; (iv) requesting that the UH Hilo Chancellor approve the revised plan; and (v) implementing the updated implementation plan once approved. The decommissioning procedures will be updated periodically following the same process if experience indicates updates would be beneficial.

UH anticipates that when the Decommissioning Plan is updated, it will retain the four fundamental components that are currently in place. Specifically, there will continue to be a requirement that facility operators: (i) submit a Notice of Intent to UH and DLNR; (ii) conduct Environmental Due Diligence; (iii) prepare and obtain approval of a Site Deconstruction and Removal Plan; and (iv) prepare and obtain approval of a Site Restoration Plan. The baseline for each decommissioning project will continue to be complete removal and full restoration.

It is envisioned that Decommissioning Plan updates will address such things as definitions, submittal content requirements and/or the level of detail required in certain decommissioning plan components, the planning process that is followed (to better align with the then-current proposal review process), and other details as informed by the lessons learned from previous decommissioning projects. UH envisions that it may be possible to streamline the approval process for projects that involve complete removal and full restoration.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Recognize that the Decommissioning Plan was developed, is being successfully implemented, and that the plan should be updated by the people most familiar with its implementation to date and have learned the most about decommissioning astronomy facilities on Maunakea: CMS.

11.4.2 SR-3: REQUIRE FUTURE FACILITIES TO CONSIDER DECOMMISSIONING DURING PLANNING

As outlined in Section 3.8.8.2 of the 2021 OAR, for many years UH has required the developers of new projects to address decommissioning during project planning and has included provisions for decommissioning funding in all subleases it has entered since the CMP was adopted. Accordingly, Item 10 in the “Sublease and Non-Exclusive Easement Agreement” between TMT International Observatory LLC and UH (which is the only new sublease that UH has issued since the CMP was adopted) deals specifically with what must be done as part of the decommissioning of that permitted facility. It specifies that upon termination the sublessee TMT must (at UH’s sole option and at sublessee’s sole cost and expense) either: (i) surrender the subleased area with all improvements existing or constructed thereon, or (ii) decommission and remove the facilities and restore the land in accordance with the CMP and the Decommissioning Plan. UH will require entities seeking its approval for projects within the UH Management Areas to address decommissioning as part of their overall project planning and will require projects to commit to specific decommissioning terms in their subleases and/or other agreements.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Reference the decommissioning provisions in the only sublease UH has entered since the CMP was approved and reinforce commitment that such provisions will continue to be a part of future agreements.

CHAPTER 12 CONSIDERING FUTURE LAND USE

12.1 INTRODUCTION

Section 7.3.4 of the 2009 CMP provided information and management actions related to future land use. Emphasizing that the CMP does not advocate or promote new telescope development but instead is aimed at managing resources, these recommended management actions are intended to proactively address issues related to the potential impacts that new land uses or activities could have on the resources. The term “future land use” is not confined solely to astronomy facility development but also encompasses such things as roadway improvements, additions to the Halepōhaku facilities, or a cultural facility such as a *hale* for Hawaiian navigation or astronomy. Information concerning the current status of future land use can be found in Section 3.9 of the 2021 OAR (Appendix A).

The CMP does not address development plan issues related to future astronomy facilities. Those, and other land use issues, are addressed in the 2022 Master Plan. The 2022 Master Plan also includes a proposal review process and design guidelines that are relevant to all land use proposals. Hence, the focus of this portion of the CMP is to guide the evaluation of proposed projects from the standpoint of potential impacts to the cultural landscape and natural resources, and to provide management actions that can be adopted by BLNR as special conditions in CDUPs that it may issue.

12.2 DESIRED OUTCOME RELATED TO FUTURE LAND USE

The “desired outcome” with respect to future land use is:

To protect the cultural landscape and natural resources in the assessment of future projects.

12.3 NEED

There is a need, during the project review process, for project proponents and UH to address siting and design considerations, so that proposed facilities have minimal impacts on the cultural landscape, natural resources, and on the astronomical value of the UH Management Areas. There is a concomitant need to ensure that the CMP and 2022 Master Plan are consistent and complementary when it comes to future land use scope, siting, design, review, and other considerations. The 2022 Master Plan takes the lead on setting land use guidance and the CMP management actions reflect provisions of the 2022 Master Plan and provide direction for entities that are developing land use proposals and direction for the UH management entity charged with reviewing and making recommendations and/or decisions related to land use proposals. Together, the CMP and 2022 Master Plan provisions are meant to ensure that new land uses result in minimal impacts to the cultural landscape, natural resources, and the astronomical qualities of the UH Management Areas.

12.4 MANAGEMENT ACTIONS

As discussed in Section 3.9 of the 2021 OAR and summarized in CHAPTER 2 of this document, six (6) of the seven (7) CMP management actions related to future land use are ongoing and one

(1) has been completed.³⁸ The six (6) ongoing management actions are listed in Table 12.1 and the nature of the work that is continuing is summarized in Sections 12.4.1 through 12.4.5.

Table 12.1 Ongoing Future Land Use Management Actions

| Mgmt. Action | Description | Discussion |
|--|--|------------|
| FLU-1 | Address design guidelines presented in the 2022 Master Plan. | 12.4.1 |
| FLU-3 | To facilitate future site restoration planning, require cataloging of site conditions prior to ground disturbance by the proposing entity. | 12.4.2 |
| FLU-4 | To facilitate assessment of potential visual impacts, require proposal-specific rendering. | 12.4.4 |
| FLU-5 | To facilitate assessment of potential impacts to the aeolian ecosystem, require airflow analysis on the design of structures proposed within or near wekiu bug habitat. | 12.4.4 |
| FLU-6 | Incorporate habitat mitigation plans into project planning process. | 12.4.5 |
| FLU-7 | To minimize adverse impacts to the cultural landscape, require the use of zero-discharge waste systems for any future development and those facilities selected to continue operating beyond 2033 in the MKSR. | 12.4.1 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | | |
| Source: Adapted from the 2021 OAR, Table 3.19. | | |

12.4.1 FLU-1 AND FLU-7: 2022 MASTER PLAN DESIGN GUIDELINES

As described in Section 3.9.2.1 of the 2021 OAR, UH followed the design guidelines and proposal review process it established in the 2000 Master Plan in reviewing all the proposals that it has received to date. This includes the very detailed review of the TMT project.

The design guidelines and proposal review process have been updated and are found in Chapter 7 of the 2022 Master Plan. FLU-1 provides that UH will convey the design guidelines and the CMP to entities preparing proposals for land uses within the UH Management Areas and that UH and other entities proposing land uses there must address the 2022 Master Plan design guidelines in their proposals. They are also advised to carefully consider and address CMP management actions IM-11, IM-13, FLU-3, FLU-4, FLU-5, and FLU-6. Furthermore, FLU-7 specifically requires that UH and other entities proposing new facilities or continuing to operate existing facilities in the MKSR beyond 2033 follow the 2022 Master Plan design guideline concerning the use of zero-discharge waste facilities. The extent to which proposals address the design guidelines and are consistent with the CMP is a major factor in UH's evaluation of all proposals.

Overall, UH will continue to implement the 2022 Master Plan framework to minimize unnecessary habitat alteration and disturbance as new facilities and land uses are proposed (FLU-1). When it comes to astronomical facilities, UH will do this by: (i) limiting astronomy facilities within the MKSR to sites on which such facilities have already been developed and/or approved, and (ii) participating in each facility's site decommissioning process (SR-1 and SR-2), which addresses the restoration of previously disturbed areas.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). To maintain compatibility and consistency between the CMP and current Master Plan, this management action now references the 2022 Master Plan and its design guidelines. Because the 2022 Master Plan

³⁸ Only FLU-2, which called for UH to develop a map with land use zones in the Astronomy Precinct based on updated inventories of cultural and natural resources, has been completed, see Chapter 2.

design guidelines include the provision to use a zero-discharge waste system, FLU-1 and FLU-7 are now complementary and are discussed together.

12.4.2 FLU-3: CATALOGING SITE CONDITIONS

As discussed in Section 3.9.2.3 of the 2021 OAR, CMS maintains file copies of reports, permit applications, permit approvals, construction plans, and other documents related to the facilities that have been constructed within the UH Management Areas. Those constitute the best information available for use in establishing the original site conditions and provide a baseline for use during site restoration as called for in the site decommissioning process (SR-1 and SR-2).

As scientific and data recording techniques and methodologies have improved over the decades since the first astronomical facilities were constructed on Maunakea, pre-development site conditions are better known for the more recently developed sites than for the ones that were developed long ago. For example, in the case of the TMT project, which is the only astronomy facility permitted after the CMP was approved, its owner conducted high-resolution surface and aerial photography to document conditions prior to development and has also collected detailed geotechnical information for use in design. That information will be available when it is time to prepare a decommissioning plan for that project.

Because UH has, through the adoption of the 2022 Master Plan, committed to limiting astronomy facilities to sites that have already been developed and/or approved for astronomy use, the kinds of additional “baseline” information that can be gathered will be different from that available from locations that have never been disturbed. Nevertheless, UH will continue to require that entities proposing to develop new facilities or expand existing ones collect information regarding topography, substrate composition, surface features, and the presence/absence and densities of species present on the work area that may be relevant to decommissioning decisions and work. The entities submitting proposals are required to collect this information prior to conducting any ground-disturbing activity, to the extent possible. Such information must be generated by the proposing entity, submitted to UH, and retained by UH and the proposing entity for use when preparing site restoration plans.

Furthermore, UH will require all proposals that the 2022 Master Plan categorizes as “Type C” to conduct baseline surveys that consider the entire area of disturbance, including access and staging areas if they have not been utilized previously. It will recommend these inventories include a buffer area extending 500 meters (1,640 feet) away from all areas anticipated to be disturbed during construction.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time; however, greater specificity and examples have been added to the discussion and those measures in the NRMP that have been found to be effective/implementable have been incorporated.

12.4.3 FLU-4: REQUIRE VISUAL RENDERING

As described in Section 3.9.2.4 of the 2021 OAR, acting through the proposal review and approval process that has been in place since the 2009 CMP was adopted, UH has required visual renderings to be prepared for all new land use proposals that had the potential to affect view planes or other

aesthetics. It has then used this information in: (i) seeking input from advisory groups and the public and (ii) making project-related decisions as to the best means of minimizing adverse visual effects.

UH will continue to require parties submitting new land use proposals that have the potential to affect view planes or other aesthetics to provide with- and without-project visual renderings and analyses. It will also require that proposal proponents minimize adverse impacts to viewplanes and other aesthetics by using architectural designs, color schemes, and materials that address the 2022 Master Plan design guidelines and are sensitive to the surrounding landscape. Visual renderings are a required element of any Type C proposal and are included as part of the proposal review process for proposed land uses. Proposal-specific visual rendering and photographs of the existing view are required and will be used to facilitate analysis of potential impacts to the viewshed, including minimizing impacts to views from cultural areas and avoiding or minimizing views of facilities from down-slope communities (e.g., Waimea and Hilo). Thus, renderings should be prepared showing the proposal as it would be seen from, for example, (i) down-slope communities, (ii) the summit of Maunakea, (iii) the top of nearby pu‘u, (iv) nearby areas of public gatherings, and (v) other locations identified by UH or the community as important viewpoints.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

12.4.4 FLU-5: REQUIRE AIRFLOW ANALYSIS

UH will continue to require that entities proposing to construct or substantially modify structures within or near wēkiu bug habitat analyze the effect that the proposed structure or earth modification would have on airflow and evaluate the effect (if any) that this is likely to have on aeolian ecosystems. Generally, such an analysis will be necessary when substantial new facilities or substantial modifications to existing facilities are proposed within or near cinder cone habitat within the MKSR, which is the preferred habitat of the wēkiu bug that feeds on insects that fallout of the aeolian winds. Thus, it is directed principally at proposals associated with Astronomy Sites 1 through 9.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time, but which proposals the requirement applies to is clarified.

12.4.5 FLU-6: INCORPORATE HABITAT MITIGATION PLANS INTO PROJECT PLANNING PROCESS

As discussed in Section 3.9.2.6 of the 2021 OAR, UH has incorporated a requirement for habitat conservation into its project planning process. This will continue and generally requires that areas disturbed during construction be restored to the extent possible.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Information obtained during preparation of the 2021 OAR indicated that no changes to this management action are needed at this time.

CHAPTER 13 OPERATIONS AND IMPLEMENTATION

13.1 INTRODUCTION

Section 7.4.2 of the 2009 CMP provides information and formulated management actions relating to operations and implementation of the CMP. While it recognizes that the CMP does not apply to other state lands on Maunakea, it notes that coordination with other entities will be required to implement the full range of management actions that it calls for, including emergency procedures. Information concerning the current status of operations and implementation can be found in Section 3.10 of the 2021 OAR (Appendix A).

13.2 DESIRED OUTCOME

The “desired outcome” with respect to operations and implementation is to:

Conduct effective operations to support management that is focused on resource protection, education, and public safety.

13.3 NEED

A strong operational foundation is needed to achieve management goals, including having sufficient funding, staffing, and facilities to implement the CMP management actions. Operations must comply with the various federal, state, and county laws and regulations that apply to the UH Management Areas and to the various activities and uses of the mountain. The importance of having a greater staff presence in the UH Maunakea Lands, as enforcers and resource managers, cannot be over emphasized. Day-to-day operations and implementation of the CMP will require that UH personnel and volunteers receive proper training in safety, emergency response, visitor orientation, and cultural landscape and natural resource protection.

13.4 MANAGEMENT ACTIONS

As outlined in Section 3.10 of the 2021 OAR and summarized in CHAPTER 2 of this document, work on two (2) operations and implementation management actions has been completed: OI-1, which called for maintaining local management, and OI-2, which called for a training plan to be developed. The three (3) other management actions are ongoing and listed in Table 13.1; the nature of the work that is continuing is summarized in Sections 13.4.1 through 13.4.3.

Table 13.1 Ongoing Operations and Implementation Management Actions

| Mgmt. Action | Description | Discussion |
|--------------|--|------------|
| OI-3 | Maintain and expand regular interaction and dialogue with community members, surrounding landowners, and overseeing agencies to provide a coordinated approach to resource management. | 13.4.1 |
| OI-4 | Address grievances through the established procedures. | 13.4.2 |
| OI-5 | Update and implement emergency response plan. | 13.4.3 |
| Note: | The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. | |
| Source: | Adapted from the 2021 OAR, Table 3.20. | |

13.4.1 OI-3: COORDINATE APPROACH TO RESOURCE MANAGEMENT

As discussed in Section 3.10.2.3 of the 2021 OAR, UH has worked and continues to work closely with neighboring landowners to coordinate its actions within the UH Management Areas with their activities. Specifically, it has: (i) formalized an agreement with DLNR-DOFAW and DLNR-NARS; (ii) coordinated closely with the Department of Hawaiian Home Lands; (iii) attempted to make its trail management efforts supportive of the Na Ala Hele Trail system's goals and objectives'; and (iv) coordinated with the Mauna Kea Watershed Alliance, whose members include the major adjacent landowners. These efforts will continue. This management action is a component of the "Outreach/Coordination Cluster" that is discussed in detail in Section 5.4.2 of this document.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now recognizes that it is a component of the "Outreach/Coordination Cluster" which details coordination with the community, agencies, and non-government organizations, including any of those that are managing resources above 6,200 feet on Maunakea.

13.4.2 OI-4: ADDRESS GRIEVANCES

As outlined in Section 3.10.2.4 of the 2021 OAR, UH has established procedures that it believes allow everyone who is concerned with management of the mountain to air grievances and for UH to work constructively to resolve them. In addition to CMS' willingness to receiving written communications at any time, members of the public can inform UH of their grievances at the public MKMB meetings held monthly; those meetings are attended by the CMS Executive Director and the UH Hilo Chancellor, when they are available.

At the present time, the formal grievance procedure consists of the following:

- An individual or group makes their grievance known through written correspondence with CMS or through testimony at a public MKMB meeting.
- If the grievance concerns management issues or items within the jurisdiction of UH, the CMS Executive Director researches the issue; consults with UH leadership, staff, and advisory groups; and coordinates with the individual or group to bring the grievance to a resolution. If the grievance is not within UH's jurisdiction, UH informs the individual or group bringing the grievance and suggest they forward their grievance to the appropriate entity.
- If the grievance cannot be resolved within a month, updates are provided at subsequent MKMB meetings and CMS continues to seek input from MKMB until a decision/resolution is reached.
- The grievance and its resolution are documented in MKMB meeting minutes.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This action now specifies the process that has been used since the CMP was approved.

13.4.3 OI-5: UPDATE AND IMPLEMENT EMERGENCY RESPONSE PLAN

As outlined in Section 3.10.2.5 of the 2021 OAR, in cooperation with the various organizations that have facilities, activities, or responsibilities within the UH Management Areas, UH has established the *Maunakea Emergency Procedures* (OMKM, July 2019), a comprehensive set of emergency response procedures for Maunakea and will continue to implement those in its day-to-day management of the area. It will also continue to provide support for implementation of DLNR's 2011 *Wildfire Management Plan for Maunakea* (Beavers, June 2011).

The feedback received during preparation of the 2021 OAR did not indicate any dissatisfaction with the existing emergency response procedures. Accordingly, CMS will continue to follow them for the foreseeable future. As with other plans and guidelines, they may be updated from time to time based on lessons learned and new developments among the various organizations that have roles in the Maunakea Emergency Procedures.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). This management action now references the plans that have been developed since the CMP was adopted.

CHAPTER 14 MONITORING, EVALUATION, AND UPDATES

14.1 INTRODUCTION

Section 7.4.2 of the 2009 CMP provided information and formulated management actions relevant to it monitoring, evaluation, and updates. The 2009 CMP was based on the state of knowledge as of December 2008 regarding the status of the resources, activity levels, and the most appropriate management actions. Recognizing that new information would become available, lessons would be learned during implementation, and that environmental conditions would likely evolve over time, it calls for the application of adaptive management principles that would allow resource managers to improve strategies and plans periodically. Information concerning the current status of monitoring, evaluation, and updates can be found in Section 3.11 of the 2021 OAR (Appendix A).

This document was prepared in part to fulfill the management actions in this chapter. As outlined below, it incorporates information learned, including information obtained through coordination with federal and state agencies and the local community in a way that is fully consistent with the adaptive management provisions of the CMP.

14.2 DESIRED OUTCOME

The “desired outcome” with respect to monitoring, evaluation, and updates is to:

Determine whether management actions are achieving the goals [desired outcomes] of the CMP and provide a process for improving and updating management strategies through evaluation and revisions of the CMP.

14.3 NEED

The CMP, like all management plans, needs to undergo regular review and update to reduce uncertainty and take advantage of (i) lessons learned during CMP implementation; (ii) new data and information from monitoring, ecosystem science, surveys, and traditional knowledge; and (iii) input from resource experts, Native Hawaiian cultural practitioners, agencies, and others familiar with particular resources. This is necessary to ensure that Maunakea’s resources are afforded the best possible protection.

14.4 MANAGEMENT ACTIONS

As described in Section 3.11 of the 2021 OAR, all three of the CMP management actions related to monitoring, evaluation, and updates are “ongoing”, meaning that guidelines and procedures are in place and are being implemented. The three management actions are list in Table 14.1 and the work that is continuing is summarized in Sections 14.4.1 and 14.4.2.

Table 14.1 Ongoing Monitoring, Evaluation, & Updates Management Action

| Mgmt. Action | Description | Discussion |
|--|--|------------|
| MEU-1 | Post tracking and assessment metrics and provide annual Progress Reports to DLNR regarding management activities. | 14.4.1 |
| MEU-2 | Conduct regular evaluations and updates of the CMP utilizing adaptive management means that address public input, incorporate lessons learned, and take advantage of new data and information. | |
| MEU-3 | Revise and update planning documents, including the master plan, leases, and subleases, to maintain compatibility and consistency between them and reflect stewardship matters resolved with DLNR. | 14.4.2 |
| Note: The exact wording of the management actions listed in the table has been revised from the 2009 CMP and the 2021 OAR to reflect the progress made to date, adaptation made based on the lessons learned, information collected, and input received. Source: Adapted from the 2021 OAR, Table 3.21. | | |

14.4.1 MEU-1 AND MEU-2: CONDUCT CMP REPORTING AND UPDATING

As described in Section 3.11.2.1 of the 2021 OAR, UH has established and is implementing a comprehensive reporting system that provides the information needed to internally track and report to others the status of its efforts to fully implement the measures called for in the CMP. UH will continue this practice by:

- Developing, posting, and regularly updating tracking and assessment metrics (MEU-1). The following applies to these metrics:
 - Purpose: Keep those interested informed of UH’s ongoing stewardship efforts.
 - Frequency: Information regarding each metric will be updated as warranted. Updates to each metric will occur at least every 6 months; however, it is envisioned that certain metrics will be updated nearly in real time.
 - Format: A “dashboard” will be developed and posted on the CMS website where each metric will be accessible.
 - Metrics: The metrics will be developed and refined based on the ability of the metric to (i) meaningfully illustrate stewardship progress or effort, (ii) relate to multiple aspects of CMP implementation, (iii) be readily measurable or otherwise scalable, (iv) address community input and interest, and (v) inform adaptations to management actions.

Examples of possible metrics include:

- The number of orientation video views.
- The number of vehicles entering the UH Management Areas.
- Number of facility, tours, and project inspections conducted that did/did not identify permit condition or sublease term violations.
- Pounds of invasive species and trash removed.
- Number of native species out planted.
- Number of vehicle and facility inspections conducted that did/did not identify the presence of invasive species.
- Number of stewardship events held that the community could participate in.

- Number of days access to the mauna was restricted for safety reasons or impossible due to weather conditions.
 - Days since last incident that required emergency response.
- Preparing and submitting Progress Reports (MEU-1). The following applies to Progress Reports:
 - Purpose: Keep oversight agency (DLNR) informed of progress and future direction of the management program.
 - Frequency: Annually, submitted to DLNR by June 30 of each year, except on years that an OAR is prepared (the OAR will serve as the Progress Report the year it is prepared).
 - Content: Regarding the last calendar year, describe the management goals, objectives, and actions that go beyond UH's baseline/ongoing management actions and what progress was made toward meeting them. Describe the management goals, objectives, and actions for the coming year that go beyond UH's baseline/ongoing management actions; this will include a description of the goals, objectives, and actions carried forward from the previous year and the improvements planned to increase the likelihood of achieving/completing them over the following years. Report on the tracking and assessment metrics. The Progress Report is not intended to be a status report on the resources in the UH Management Areas nor is it meant to provide a detailed status update on every CMP management action.
 - Process: Prepared by UH with an opportunity for advisory groups to provide input, then UH submits to DLNR. If required by DLNR, UH will also make a presentation regarding its progress report to BLNR.
- Preparing, circulating, and submitting an Outcome Analysis Report (OAR) (MEU-2, evaluation step). The following applies to OARs:
 - Purpose: Same as the annual Progress Report but it is more comprehensive and is intended to objectively examine all aspects of the ongoing stewardship in a manner that informs adaptive management decisions related to the management actions.
 - Frequency: Roughly every five (5) years.
 - Content:
 - Part 1: Describe the state of the cultural landscape, natural resources, and astronomical resources by summarizing data collected and new information accumulated since the previous OAR was prepared; report on the tracking and assessment metrics and identify trends, if any, in the metrics and other data or information gathered; and summarize the apparent effects (positive, negative, neutral) that the management actions are having on the resources.
 - Part 2: Summarize the status of each management action (tabular summary acceptable).
 - Part 3: Summarize the progress toward meeting each of the desired outcomes; the UH management entity's strengths and weaknesses; relevant new laws, rules, regulations, and guidance documents that have come into effect since the last OAR; and concepts for how existing management actions may be adapted

and new management action may be added to make greater strides toward achieving the desired outcomes in the future.

- Process: UH prepare a Draft OAR; UH provide Draft OAR to advisory groups, DLNR, and neighboring landowners for review and comment; UH prepare a final OAR that addresses input received; and UH submit final OAR to DLNR.
- Preparing, circulating, and submitting a CMP Supplement (MEU-2, updating step). The following applies to CMP supplements:
 - Purpose: Implement an adaptive management approach to updating the CMP's management actions as informed by the OAR.
 - Frequency: Immediately following the completion of an OAR.
 - Content: Similar to this supplement, adapt the CMP management actions as informed by the information and analysis in the OAR. Native Hawaiian knowledge and methods as well as contemporary management tools will inform updates to existing and, potentially, the establishment of new management actions. Specifically, this will include knowledge accumulated through the implementation of NR-4 (Section 3.4.4) and the k  n  w  i principles discussed in the MKWG Report (Mauna Kea Working Group, December 2021). Other portions of the CMP will be supplemented as deemed appropriate. The OAR prepared before the supplement will be included as an attachment.
 - Process: UH prepare a Draft CMP Supplement; UH announce the availability of the supplement for review to every entity on its mailing list; UH prepare a Final CMP Supplement that addresses input received; UH submits Final CMP Supplement to the BOR and then BLNR for approval/adoption.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Added a tracking and assessment metric program to address public and agency input. Also, provide a greater level of specificity regarding the various reports and the process for document development, review, and, when necessary, approval.

14.4.2 MEU-3: REVISE AND UPDATE PLANNING DOCUMENTS

As discussed in Section 4.10.1.2 of the 2021 OAR, UH has endeavored to keep the planning documents that govern land use within UH's Maunakea Lands consistent with the goals and objectives of the CMP, thereby promoting the responsible stewardship and use of UH Management Areas on Maunakea. Specifically:

- Provisions of the CMP have been a key element in formulating the 2022 Master Plan³⁹ and in negotiating terms of subleases.⁴⁰ These documents are consistent with, incorporate, and reference the CMP. If they are amended or updated, they should continue to be consistent with, incorporate, and reference the CMP.

³⁹ UH released the public review draft of the 2022 Master Plan on September 12, 2021, and the BOR approved the 2022 Master Plan on January 20, 2022; it will guide land use within the UH Maunakea Lands for 20 years.

⁴⁰ The only sublease approved since the adoption of the 2009 CMP has been the TMT sublease.

- Because UH and the other astronomy facility owners wish to continue astronomical activities on Maunakea beyond the end date of its current master lease, the BOR has informed the BLNR that it intends to seek a new land authorization. It anticipates that should a new land authorization be granted to UH, then all subsequent agreements between UH and the astronomy facilities will be consistent with, incorporate, and reference the CMP.

Summary of adaptations (this paragraph summarizes the adaptations to this management action since 2009; it is provided to inform readers, it is not part of the management action). Specify the process that has been used since the CMP was approved and will continue.

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