2020 Soil Conservation Standard and Guidelines

California Department of Parks and Recreation

Off-Highway Motor Vehicle Recreation Division

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List of Abbreviations

Abbreviation	Definition
BLM	Bureau of Land management
BMP	Best Management Practice
CARC	Consulting Agency Review Committee
CCR	California Code of Regulation
CGS	California Geological Survey
CDFW	Department of Fish and Wildlife
DRW	California Department of Water Resources
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CWA	Clean Water Act
DPR	California Department of Parks and Recreation
EHR	Erosion Hazard Rating
FESA	Federal Endangered Species Act
GIS	Geographic Information Systems
GRAIP	Geomorphic Road Analysis and Inventory Package
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
OHMVR	Off-Highway Motor Vehicle Recreation
OHV	Off-Highway Vehicle
PRC	Public Resources Code
QA/QC	Quality Assessment/Quality Control
RUSLE	Revised Universal Soil Loss Equation
SB	Senate Bill

SCP	Soil Conservation Plan
SVRA	State Vehicular Recreation Area
USFS	United States Forest Service
USGS	United States Geological Survey
WEEP	Water Erosion Prediction Project
WEPS	Wind Erosion Prediction System

1.0 2020 Soil Conservation Standard

1.1 Review and Update

In October 2017, Senate Bill 249 was enacted, requiring the California State Parks (DPR), Off-Highway Motor Vehicle Recreation (OHMVR) Division to:

> "…review, and if deemed necessary, update the 2008 Soil Conservation Standard and Guidelines to establish a generic and measurable soil conservation standard by December 31, 2020 (Public Resources Code, Section 5090.35 (b))."

The 2008 Soil Conservation Standard and Guidelines are intended to ensure appropriate resource management and maintenance in areas of off-highway vehicle (OHV) use. They specifically apply to: (1) All OHV-related trail and road maintenance projects, (2) all OHV-related development projects, on federal and local government lands that receive funding from the California OHV Grants and Cooperative Agreements Program, and (3) California's State Vehicular Recreation Areas (SVRAs).

The review process has found that the 2008 Soil Conservation Standard and Guidelines (2008 Standard and Guidelines), developed in consultation with federal land managers (U.S. Forest Service and the U.S. Bureau of Land Management), has provided an effective framework for soil resource conservation for the OHV Management. However, some updates to the document were identified. State and Federal members of the Consulting Agencies, were surveyed to receive input on updates to the 2008 Standard and Guidelines. Survey responses were reviewed, summarized, and considered in the revision process. A revised draft was sent to the Consulting Agency Review Committee (CARC), a consulate consisting of the United States Natural Resource Conservation Service, the United States Geological Survey, the United States Forest Service, the United States Bureau of Land Management, the California Department of Fish and Wildlife, and the Department of Conservation to review and provide feedback. A finalized draft was posted for public review and comment before the final version was adopted on xx. Per the review findings, the 2008 Standard and Guidelines have been updated for clarity, use, and to account for technological changes in vehicles used for OHV recreation.

1.2 2020 Soil Conservation Standard

The 2008 Soil Conservation Standard (Standard) and Guidelines (Guidelines) provides guidance to achieve the following standard:

> Off-highway vehicle (OHV) recreation facilities shall be managed for sustainable long-term prescribed use without generating soil loss that exceeds restorability, and without causing erosion or sedimentation which significantly affects resource

values beyond the facilities. Management of OHV facilities shall occur in accordance with Public Resources Code, Sections 5090.2, 5090.35, and 5090.53.

Presented below are statutes and regulations that apply to the 2020 Standard; and definitions of terms in the 2020 Standard. These are followed by the 2020 Guidelines. The 2020 Guidelines provide tools and techniques that may be used to meet the 2020 Standard. Other tools and techniques that are more applicable to specific facility conditions and organizational protocols may be used as appropriate to comply with the 2020 Standard.

1.3 Applicable Statutes and Regulations

1.3.1 Public Resources Code

Section 5090.02 (c) of the Public Resources Code (PRC) states the California Legislature's intent with regard to soil conservation:

> 5090.02 (c)(1) Existing off-highway motor vehicle recreational areas, facilities and opportunities be expanded and be managed in a manner consistent with this chapter, in particular to maintain sustained long-term use.
>
> 5090.02 (c)(2) New off-highway motor vehicle recreational areas, facilities, and opportunities be provided and managed pursuant to this chapter in a manner that will sustain long-term use.
>
> 5090.02 (c)(3) The department should support both motorized recreation and motorized off-highway access to non-motorized recreation.
>
> 5090.02 (c)(4) When areas or trails or portions thereof cannot be maintained to appropriate established standards for sustained long-term use, they shall be closed to use and repaired, to prevent accelerated erosion. Those areas shall remain closed until they can be managed within the soil loss standard or shall be closed and restored.

Implementation practices to meet the Soil Conservation Standard within SVRAs are in Section 5090.35 of the PRC, as presented below:

> 5090.35 (a) The protection of public safety, the appropriate utilization of lands, and the conservation of natural and cultural resources are of the highest priority in the management of the state vehicular recreation areas. Additionally the division shall promptly repair and continuously maintain areas and trails, and anticipate and prevent accelerated and unnatural erosion and other off-highway vehicle impacts to the extent possible. The division shall take steps necessary to prevent damage to significant natural and cultural resources within state vehicular recreation areas.

5090.35 (b)(2) If the division determines that the soil conservation standards and habitat protection plans are not being met in any portion of any state vehicular recreation area, the division shall temporarily close the noncompliant portion to repair and prevent accelerated erosion, until the soil conservation standards are met.

5090.35 (b)(3) If the division determines that the soil conservation standards cannot be met in any portion of any state vehicular recreation area, the division shall close and restore the noncompliant portion pursuant to Section 5090.11.

5090.35 (d) The OHMVR shall monitor the condition of soils and wildlife habitat in each SVRA each year in order to determine whether the soil conservation standards and habitat protection programs are being met.

5090.35 (e) The division shall not fund trail construction unless the trail is capable of complying with the conservation specifications prescribed in this section. The division shall not fund trail construction where conservation is not feasible. The division shall not fund the maintenance of a trail unless that trail is a component of a state vehicular recreation area road and trail system.

Section 5090.39(a) of the PRC directs that the department shall require that:

5090.39(a)(1) Any soil conservation standard, wildlife habitat protection plan, or monitoring program, required by this chapter, applies best available science.

5090.39(a)(2) All standards, plans, and monitoring programs subject to paragraph (1) shall provide opportunities for public comment, including, but not limited to, written comments and public meetings, as appropriate.

Similarly, Section 5090.53 of the PRC states that no funds may be granted or expended for the acquisition of land for, or the development of, a trail, trailhead, area, or other facility for the use of off-highway vehicles unless all of the following conditions are met:

5090.53(a) If the project involves a ground disturbing activity, the recipient has completed wildlife habitat and soil surveys and has prepared a wildlife habitat protection program to sustain a viable species composition for the project area.

5090.53(b) If the project involves a ground disturbing activity, the recipient agrees to monitor the condition of soils and wildlife in the project area each year in order to determine whether the soil conservation standards adopted pursuant to Section 5090.35 and the wildlife habitat protection program prepared pursuant to subdivision (a) are being met.

5090.53(c) If the project involves a ground disturbing activity, the recipient agrees that, whenever the soil conservation standards adopted pursuant to Section

5090.35 are not being met in any portion of a project area, the recipient shall close temporarily that noncompliant portion, to repair and prevent accelerated erosion, until the same soil conservation standards adopted pursuant to Section 5090.35 are met.

1.3.2 Other Applicable Laws and Regulations

The 2020 Guidelines are to be used in conjunction with provisions of PRC 5090 et seq. and CCR 4970 et seq. for OHV use. However, it is the land managers' responsibility to recognize other local, state and federal laws and regulations that are applicable to the assessment and management of OHV areas, especially where unique environmental conditions exist. Examples include, but are not limited to: the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA); the Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA) and the California Porter-Cologne Act; the Federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA); California Fish and Game Code; the Federal and State Clean Air Acts; statewide Airborne Toxic Control Measure regulation covering naturally occurring asbestos; federal, state, and local laws/ordinances that address erosion control and rider safety issues associated with mined land sites and other hazardous excavations within public lands used for OHV activities; the Resource Conservation and Recovery Act, the Surface Mining Control and Reclamation Act, and the California Surface Mining and Reclamation Act; the National Forest Management Act; and the Antiquities Act, the National Historic Preservation Act, the Archaeological Resources Protection Act, the Native American Graves Protection Act, and the American Indian Religious Freedom Act.

1.4 Definitions of Terms for the 2020 Standard

Erosion: The wearing away of rock or soil by the detachment of soil or rock fragments by water, wind, ice, and other mechanical or chemical forces (CDPR 2008).

Facility: An OHV trail, track, road, corridor, SVRA, open-ride area, staging area, parking area (excluding structures) (CDPR 2008).

Ground Disturbing Activity: any earth moving Project-related activity. The act of installing and/or replacing a sign, placing of boulders or other materials (other than fencing) to delineate a Facility, maintenance or replacement of existing fence lines that do not require disturbance beyond replacement of fence posts and wire or existing component, or sweeping sand/dirt from a paved road are not considered a "Ground Disturbing Activity". (14 CCR 4970.01)

Long-Term: At a minimum, 25 years [California Code of Regulations (CCR) 4970, 2005].

Management: The coordinated implementation of budgeting, staffing, scheduling, design, construction, maintenance, monitoring and restoration activities at an OHV facility, as needed, combined with the effective utilization and coordination of resources, such as capital, labor, materials, and natural landscape, to achieve the soil conservation standard, and to ensure effective and efficient use of OHV recreational opportunities while protecting natural and cultural resources (CDPR 2008).

Management Unit: Area of land with distinct boundaries that often includes lands with similar resources and management objectives. Management units define manageable-sized areas for organizing and scheduling maintenance work.

Off-Highway Vehicle: An off-highway motor vehicle as specified in CVC Section 38006 and street licensed motor vehicles while being used off-highway (CCR 4970, 2005).

Prescribed Use: The type of OHV activity at the facility as established by the managing entity (CDPR 2008).

Project: means the activities and deliverables described in the project application to be accomplished with funding through, which includes both Grant funds and matching funds a project agreement. (14 CCR 4970.01)

Project Area: the physical boundaries within which the activities will be performed, and deliverables will be accomplished as described in the project agreement. (14 CCR 4970.01)

Restoration: Means, upon closure of the unit or any portion thereof, the restoration of land to the contours, the plant communities, and the plant covers comparable to those on surrounding lands or at least those that existed prior to off-highway motor vehicle use (PRC Sec. 5090.11).

Sedimentation: The process by which soils, debris, and other materials are deposited, either on land or in water (CDPR 2008).

Significant: Having a substantial or potentially substantial effect (CDPR 2008).

Soil: All unconsolidated materials above bedrock; the unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants; the unconsolidated mineral or organic matter on the surface of the earth that has been subjected to and shows effects of genetic and environmental factors of climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief, acting upon parent material over time. Soil differs from the material from which it is derived in many physical, chemical, biological and morphological properties and characteristics (AGI, Glossary of Geology, 1997).

Soil Loss: Movement of soil material to a location where the soil cannot be reasonably retrieved and/or recycled (CDPR 2008).

Sustainable: The facility is managed to meet the soil conservation standard for a minimum service life of 25 years (CDPR 2008).

See Appendix 1 for additional OHV-related definitions.

2.0 2020 Soil Conservation Guidelines

California's complex geology, varied topography, wide range of climate, and associated vegetation combine to create varied landscapes on which OHV recreation occurs. The soils and rock that mantel these landscapes have a broad range of associated engineering properties, which can make erosion control challenging. The Guidelines are written to provide flexibility to allow their application to all OHV sites statewide. Because the Guidelines serve as resource management guidance for OHV use on prescribed trails and roads, multiple-use roads, and in open ride areas, it is the responsibility of the land manager to determine the recreational activity causing any specific resource damage and initiate the appropriate action. Recipients of funding from the California OHV Grants and Cooperative Agreements Program and SVRA managers may use or modify the example guidance presented herein, or may create their own reporting forms, as appropriate, for their facility and/or organizational needs, as long as the various components of the Guidelines are addressed.

2.1 Background

These Guidelines were developed as called for under SB 249, with input from representatives from California State Parks (DPR) Off-Highway Motor Vehicle Recreation (OHVMR) Division, DPR Natural Resources Division, California Geological Survey Division of the Department of Conservation, California Department of Fish and Wildlife (CDFW), Natural Resource Conservation Service (NRCS), U.S. Bureau of Land Management (BLM), and U.S. Forest Service (USFS).

2.2 Objective of the Guidelines

The objective of these Guidelines is to ensure compliance with the 2020 Soil Standard at OHV facilities that receive OHV Trust Fund monies for ground-disturbing activities where legal OHV recreation is allowed. Specifically, this document provides guidance on what successful compliance looks like, how to meet the 2020 Standard through assessment and monitoring, and the use of Soil Conservation Plans and subsequent Compliance Reports at each of the following:

- SVRAs
- OHV Trust Funded Projects with Ground-disturbing activities

- Operations and Maintenance Projects
- Development of New Facilities and Areas

Additionally, this document provides helpful resources and specific technical information on common practices and techniques for consideration in the design, development, and remediation of OHV facilities.

2.3 Defining Successful Compliance with the 2020 Soil Standard

Public Resources Code 5090.35.(b)(1) requires that the Soil Conservation Standard be "generic and measurable". The Standard provides several criteria which are required to be met in demonstrating successful compliance. This section of the guidelines is intended to provide specific linkages to definitions which allow interpretation of the 2020 Soil Standard.

Parties assessing compliance should consider the following components of the Standard.

1. "Sustainable long-term prescribed use" - Successful compliance with the Standard requires that OHV facilities be managed for sustainable and long-term use. Sustainability refers to soil management practices that do not degrade or impair environmental quality on or offsite, and without eventually reducing yield potential as a result of the chosen practice through exhaustion of either on-site resources or nonrenewable inputs[1]. Sustainable prescribed use would be minimum service life of 25 years (CDPR 2008)[2].

2. In order to meet the criteria of sustainable long-term use, soil loss must not exceed restorability. Important components of soil management practices to ensure soil loss does not exceed restorability include: assessment of erosion potential, soil inventories and OHV trail conditions; Soil Conservation Plans; maintenance of facilities; and monitoring programs. For example, an erosion potential assessment is intended to identify areas which may be inherently more prone to erosion and therefore in need of monitoring or avoidance. PRC 5090.02 (c)(4) requires that when areas or trails or portions thereof cannot be maintained to appropriate established standards for sustained long-term use, they shall be closed to use and repaired, to prevent accelerated erosion. Those areas shall remain closed until they can be managed within the soil loss standard or shall be closed and restored. Restoration of these areas means that upon closure of the

[1] Appendix 1: Definitions – see "sustainability"

[2] Appendix 1: Definitions – see "sustainable"

unit or any portion thereof, the return of land to the contours, the plant communities, and the plant covers comparable to those on surrounding lands or at least those which existed prior to OHV use, as defined in PRC 5090.11 and 14 CCR 4970.01.

Erosion and sedimentation are both natural processes, but poor trail design, or trails not appropriately maintained can intercept and concentrate natural water runoff, leading to accelerated erosion and excessive sedimentation. OHV facilities should be designed and maintained to limit accelerated erosion, and utilize proper monitoring to ensure sediment leaving the OHV facility does not significantly impact resource values beyond the facility. Water and air quality studies can provide useful data in addition to OHV facility assessment, that can help evaluate successful compliance.

An evaluation of successive assessments performed on an OHV trail facility, as well as maintenance records, may reveal perennial trouble spots, trail segments that require more maintenance to ensure the trail tread is maintained and erosion does not become excessive. Routine ground operations may be able to keep these segments in check, but a lapse in maintenance on the trail or an extreme weather event may reveal the overall unsustainability of these trail segments. In these cases, it behooves land managers to more critically assess these trail segments. The trail system may need more drainage outlets, a redesign of a watercourse crossing, hardening of a trail section, trail-rerouting, etc., to ensure the trail sustainability.

The 2008 Soil Conservation Standard and Guidelines defined sustainability as meeting the soil conservation standard for a minimum service life of 25 years. To provide additional guidance on what it means to meet trail sustainability, we look to the USFS's definition of a sustainable natural surface trail as "a trail that supports currently planned and potential future uses with minimal impact and negligible soil loss. The sustainable trail will require little rerouting and minimal maintenance over extended periods of time"(USFS 2013). Factors to take into account regarding trail sustainability and restorability include, but are not limited to: maintenance cycle, soil and site stability, hydraulic function, and biotic integrity.

2.4 Where to Apply the Standard

The Standard applies to both SVRAs and projects funded by OHV Grants and Cooperative Agreements Program.

An SVRA is defined as a facility and therefore the Standard applies to the OHV-related features within the SVRA. Senate Bill (SB) 249 revised PRC 5090.43 to direct SVRAs be developed, managed and operated for the conservation and improvement of natural resource values over time. SB 249 also updated requirements in PRC 5090.35 to demonstrate compliance with the Standard through annual monitoring of the condition of soils in order to determine whether the Standard is being met. Development of Soil

Conservation Plans (SCPs) and documentation of maintenance and monitoring activities provide the tools needed to assess compliance with the Standard. Successful compliance of the Standard at these State-managed units is consistent with DPR's Operations Manual, Section 0308, and with DPR's Strategic Plan.

Each SVRA shall submit a SCP, to the OHV Division, which covers the entire area of the SVRA. Due to management constraints and operational logistics, the implementation of an SVRA's SCP may occur over several years. SCPs are to be reviewed every 5 years, including a review for CEQA compliance, and updated as needed. If a SCP includes any new actions, or any actions that are not covered by an existing CEQA document, it may need further environmental review to ensure compliance with CEQA.

The OHV Grant program provides resources to be used for a variety of project types that include ground operations, development, planning, acquisition, maintenance, restoration, law enforcement, education and safety. Grantees include cities, counties, federal agencies, federally or state recognized Native American tribes, educational institutions, non-profit organizations, State agencies, Districts and certified Community Conservation Corps. Cities, counties, U.S. Forest Service and U.S. Bureau of Land Management are eligible to apply for grants to be used for any of the project types described above. Other federal agencies, recognized Native American tribes and Districts are eligible to apply for grants to be used for any of the project types except for law enforcement. Educational facilities, nonprofit organizations and certified Community Conservation Corps can apply for grants to be used for ground operations, restoration, education and safety. State agencies can apply for grants to be used for restoration projects. Per CCR Title 14, Division 3, Chapter 15, subsection 4970.06.3 (c), Ground Operations and Development projects involving Ground Disturbing Activities and receiving grant funding shall submit a SCP with regard to the proposed Project. The goal of a SCP is to demonstrate successful compliance with the Standard by incorporating assessments, maintenance planning and monitoring within the Project Area. The following provides more detail on these types of projects that are to comply with the Standard.

- Ground Operations Projects - The purpose of ground operations projects is for the maintenance and/or conservation of facilities. Examples of ground operations projects that must comply with the Standard include: Maintenance such as necessary reconditioning or rerouting of roads and trails to address operational concerns and recreational opportunities; repaving existing parking lots; Implementation of best management practices including erosion and/or sediment control measures and stream crossing improvements and SCP implementation.
- Development Projects - The purpose of development projects is for the construction of, or improvements to, facilities to sustain or enhance OHV recreational opportunity and experiences. Examples of development project activities include: trail and trailhead/staging area construction; access road and

parking lot construction; sedimentation basin/pond installation; and discretionary rerouting of roads or trails.

2.5 Approaches to Evaluating Compliance with the 2020 Soil Standard

The follow guidance is intended to help inform resource managers on how to evaluate and demonstrate compliance with the 2020 Soil Conservation Standard, at three scales: the "Project Area" for OHV Grants and Cooperative Agreement Program, within "Management Units" of SVRA facilities, and for entire SVRA facilities.

At the Project Area scale, SCPs are used to provide a framework for constructing, maintaining, and evaluating the efficacy of grant-funded ground operations and development, projects through assessment, best practices, and monitoring.

At the Management Unit and entire SVRA facility scale, SCPs are used to provide a framework for assessing current conditions, inventorying maintenance and repair needs, and monitoring conditions over time to ensure sustainability of the facility.

2.5.1 Project, Project Area, Soil Conservation Plan

Table 1. Summary of required planning and reporting documents by grantees and SVRAs.

Planning and Reporting Documents	Update Cycle	Relevant Section in Soil Conservation Standard and Guidelines
Soil Conservation Plan	Grantees = Develop at beginning of project for project area SVRAs = Develop for entire SVRA , review every 5 years and update as needed	2.5.1
Maintenance Plan (component of Soil Conservation Plan)	Grantees = Develop at beginning of project SVRAs = Update annually	2.5.1, 2.5.3
Monitoring Plan (component of Soil Conservation Plan)	Grantees = Develop at beginning of project SVRAs = Update annually	2.5.1, 2.5.4
Compliance Report and Action Plan	Grantees = Submit at end of project SVRAs = Submit annually. Per SB-249 requirements, annual monitoring is required to demonstrate compliance with the Soil Standard at each SVRA. Annual monitoring and analysis is a component of the Compliance Report and Action Plan.	2.5.5

Definitions of "Project," "Project Area," "Ground Disturbing Activity," and other terms relevant to SCPs and the 2020 Standard are provided Section 1.4 and Appendix 1. The contents and intent of the SCP is further detailed below, as per Title 14, Division 3, Chapter 15 of the CCR, subsection 4970.06.3:

(d) The Soil Conservation Plan shall reference, adopt, and utilize the methods, considerations, and other suggestions contained in the Soil Guidelines or other comparable methods or considerations that demonstrate how the Soil Conservation Standard is being or will be met in the Project Area.

(e) The Soil Conservation Plan shall include:

(1) A map or maps clearly defining the Project Area where ground disturbing activities related to the Project will take place.

(2) For grant recipients, an initial, map-based assessment of existing conditions within the Project Area that quantifies or otherwise identifies grant funded work to be performed within the Project Area. For SVRAs, an initial, map-based assessment of existing conditions within the Management Unit that quantifies or otherwise identifies work to be performed. Examples include, but are not limited to:

(A) Color-coded trail evaluations that identify and quantify trail lengths to be repaired and/or maintained.

(B) Boundaries of OHV riding areas to be repaired and/or maintained,

(C) Watercourse crossings and drainage control features used to disperse runoff and minimize sedimentation.

(3) A maintenance plan for the Project Area/Management Unit that describes:

(A) The current trail maintenance schedule,

(B) the type of maintenance conducted,

(C) equipment used for maintenance within the Project Area, and

(D) procedures for documenting maintenance activities.

(4) A description of monitoring procedures to be used for ensuring grant-funded work within the Project Area is adhering to the Soil Conservation Standard. The description shall include:

(A) Monitoring methods to be employed,

(B) a monitoring schedule, and

(C) anticipated management of collected monitoring data, such as the use of a Geographic Information System (GIS) database.

The following sections (2.5.3-2.5.7) provide detailed guidance on the use of assessments, maintenance planning, monitoring techniques, compliance reporting and other management and monitoring plans in SCP development.

2.5.2 Use of Assessments

The purpose of assessments and reassessments is to document soil conditions within the Project Area, resource Management Unit, or OHV facility in order to identify maintenance/repair needs, evaluate trail performance, and establish a process for future monitoring. At the Project Area scale, assessments identify conditions and can inform project planning, execution, and post construction monitoring. At the Management Unit and OHV facility scale, assessments are used to target field surveys and visual inspections to areas of concern, to estimate background rates of erosion, and to establish an inventory of data that can be used to analyze changes in conditions over time and help identify areas that need additional monitoring and/or maintenance.

Assessments and monitoring include systematic analysis of physiographic data, field data collection, and trail condition evaluation to inform design, development, operation, and routine maintenance of an OHV facility. Several techniques are available to focus the scope of assessments and monitoring at large or expansive OHV facilities, including the delineation of Management Sub-units, analysis of erosion potential, and application of tools that aid in trail condition rating. These techniques require physiographic information including terrain and geologic and/or soils data, annual average precipitation data, and watershed and waterway delineation to inform Geographic Information Systems or check-list based analysis of expected conditions. The following sections review the use of field surveys and visual inspection, analysis of erosion potential, OHV Trail Condition Evaluation, and other general information used in conducting large-scale facility evaluation.

2.5.2.1 Assessing Erosion Potential

The primary purpose of an erosion potential assessment at an OHV facility is to identify areas which may be inherently more prone to erosion, and consequently may need specific drainage and erosion control design considerations. Several approaches can be used to estimate the potential for erosion on OHV facility lands. However, most large-scale methods of assessing erosion potential do not account for erosion susceptibility to the trail tread. They are, however, useful in providing an assessment of erosion potential of broad landscapes on which a trail network may be planned or redesigned and are useful for assessing erosion potential within open-ride areas.

Note that erosion of the trail tread is a function of the mechanical energy of the vehicle, the drainage controls on the trail and surrounding area, and the nature of the underlying soils. Therefore, with proper planning, design, construction, and maintenance, a trail can perform well by exhibiting little erosion in an area that is naturally more sensitive to erosion; while a poorly planned, designed, constructed, or maintained trail may erode in an area that is not naturally prone to erosion.

2.5.2.1.1 Physiographic Data Used in Erosion Potential Assessments

Several types of data are used in assessing the potential for erosion of the landscape. Depending on the scale of the project, a more detailed review of the physical setting of the OHV facility and the project site may be necessary. Table 1 describes key data and sources used in erosion assessments.

Table 2. Key data types typically used in erosion assessment and description of the data and source.

Data Type	**Description and Data Source**
Topography	Topographic data are used to determine slope, aspect, ridgelines, landslides, and can inform watershed delineation. GIS layers and online mapping tools can be found here: • United State Geologic Survey (USGS): https://www.usgs.gov/core-science-systems/ngp/tnm-delivery/topographic-maps, https://viewer.nationalmap.gov/basic/and https://ngmdb.usgs.gov/topoview/ • California Geologic Survey (CGS): https://www.conservation.ca.gov/cgs/maps-data

Climate	Climate data are used to determine average and extreme precipitation, for estimating runoff, prevalence of soil and slope instability, dust, and inform revegetation efforts. Location specific climate information can be found here: • National Oceanic and Atmospheric Administration (NOAA): https://www.ncdc.noaa.gov/data-access/land-based-station-data and https://gis.ncdc.noaa.gov/maps/ncei • California Department of Water Resources (DWR): http://cdec.water.ca.gov/snow_rain.html and http://cdec.water.ca.gov/snow/current/snow/index.html • Oregon State University: https://prism.oregonstate.edu/
Geology and Soils	These data provide type, distribution, and physical characteristics of rock and information on soil compaction, drainage, subsidence, etc.. Location specific geology and soil data can be found here: • CGS: https://www.conservation.ca.gov/cgs/maps-data • USGS: https://www.usgs.gov/products/maps/geologic-maps and https://www.usgs.gov/natural-hazards/earthquake-hazards/hazards • Natural Resource Conservation Service (NRCS): https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053628 and https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
Vegetation	Vegetation data provide information on vegetation land cover, native and non-native plant species, and potential for colonization of invasive non-native species. Vegetation, landcover, and aerial photograph datasets can be found here: • United States Department of Agriculture: https://nassgeodata.gmu.edu/CropScape/ • California Department of Conservation: https://www.conservation.ca.gov/dlrp/fmmp/Pages/county_info.aspx • California Department of Fish and Wildlife (CDFW; VegCAMP) https://wildlife.ca.gov/Data/VegCAMP • CDFW National Agricultural Imagery Program: https://wildlife.ca.gov/Data/GIS/Map-Services • University of Montana: https://rangelands.app/ • CalFire https://frap.fire.ca.gov/frap-projects/fire-perimeters/

Wildlife	Wildlife data provides information on the presence of sensitive species to minimize and avoid impacts. Wildlife data are available here: • CDFW: https://wildlife.ca.gov/data/cnddb
Watersheds and Watercourses	Watershed data are used to estimate runoff potential. Watercourse data allow identification of the location of sensitive water resources such as draws, creeks, and streams. Watershed delineations and water course data are available here: • DWR: https://gis.water.ca.gov/app/boundaries/ • United States Geological Survey (USGS): https://water.usgs.gov/wsc/reg/18.html • CDFW: https://wildlife.ca.gov/Data/BIOS/Dataset-Index • UC Davis: http://cwam.ucdavis.edu/
Hydrology	Hydrology datasets provide information on stream flow where those data exist. This information can be used in the design or assessment of water crossings and erosion assessment. Hydrology data are available from USGS, National Oceanic and Atmospheric Administration (NOAA), and DWR. Hydrology data for California waterways are available here: • USGS: https://www.usgs.gov/core-science-systems/ngp/national-hydrography and https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools • NOAA: https://water.weather.gov/ahps/forecasts.php • DWR: https://cdec.water.ca.gov/
Sea Level Rise	Sea level rise and flood visualization tools have been developed and made available online for land managers to identify potential issues with sea level rise and flooding. Multiple tools are available, many of which can be filtered and compared here: • Sea the Future: https://www.seathefuture.org/#/

Water Quality	Water quality provides information on stream conditions and sediment loads in water courses. Water quality information can be found here: • State Water Resources Control Board: https://www.waterboards.ca.gov/plans_policies/ https://ceden.waterboards.ca.gov/AdvancedQueryTool • USGS: https://waterdata.usgs.gov/nwis/gw Depending on local conditions and requirements, an OHV facility may need to have a water quality management plan. If a listed water body in a Basin Plan is within or adjacent to an OHV facility, develop a water quality management plan that addresses those constituents of concern listed for that water body in the Basin Plan, as well as other water quality concerns specific to the facility.
Air Quality	Air quality data can be used to determine air quality concerns, including those derived from naturally occurring minerals such as asbestos which may be exposed on ground surfaces at an OHV facility. Air quality data are available here: • California Air Resources Board www.arb.ca.gov Air quality monitoring may be warranted, but if it is undertaken, take extreme care to determine and reliably quantify all sources impacting air quality adjacent the OHV facility. Additionally, determine the direction of prevailing winds in the vicinity of the OHV facility. Quantify sources impacting air quality that are delivered to and over the OHV facility due to prevailing winds.

2.5.2.1.2 Desktop Data Exploration

The use of Geographic Information Systems (GIS) or online web viewers allow users to explore the datasets identified in Table 1 to identify areas with high erosion potential or sensitive resources.

Aerial photo or satellite imagery can be reviewed for mass wasting erosion features such as debris flows, landslides, and rock falls that are not discerned by on-the-ground methods of erosion potential assessment. Typically, historical air photos and other imagery covering the last 50 years are used in conjunction with soils maps and geologic maps to develop relative erosion and mass wasting susceptibility maps for a specific project area.

Delineation of a project area, or resource management areas, can aid in focusing review and analyses. Subject areas are divided into regions of similar geology using a geologic map and an overlay map. The regions drawn onto the overlay map are subdivided into areas of the same soil using soil survey data available from the NRCS. Descriptions of soils in NRCS soil surveys typically include broad evaluations of erosion susceptibility for a soil type.

Topographic data can be used to further subdivide areas according to slope gradient range, e.g., zero to 15 percent, 15 to 30 percent, etc. Steeper slopes are more prone to erosion processes.

2.5.2.1.3 Watercourse Classification – Sensitive Aquatic Resources

Identify watercourses according to constancy of flow and the degree to which they support aquatic life and riparian species. The following watercourse type definitions were slightly modified from the 2020 California Forest Practice Rules (Title 14, CCR, Ch. 4, 4.5 and 10) to adjust with consideration for OHV facility management. Individual agencies may use their own nomenclature for watercourse type but should explain how it corresponds with the definitions below. These classifications can then be used in assessing OHV-related erosion impacts on to sensitive natural resources.

- Class I Watercourse: This watercourse can be 1) a fish-bearing stream, where fish are always or seasonally present, and includes habitat necessary for spawning and migration; or 2) a domestic water supply, including a spring, on site or within 100 feet downstream of an area of operations.
- Class II Watercourse: This class of watercourse drainage usually does not flow continuously throughout the year but does flow for an extended period of time beyond the rainy season, and so is also called an “intermittent” watercourse. Pools in this class of drainage may be present throughout the year, providing habitat for fish or other aquatic species, such as amphibians.
- Class III Watercourse: This type of watercourse usually flows only in response to adequate rainfall or snowmelt. Consequently, it is often called an “ephemeral” watercourse. Class III watercourses may show evidence of sediment and debris transport from past debris flows or high-runoff events.

2.5.2.1.4 Watercourse Crossing Analysis

A watercourse crossing analysis can be conducted manually or with the use of software, such as GIS, and is conducted by creating an overlay map that marks all points where trails and roads cross watercourses. This creates a watercourse/trail node map which illustrates locations where acute erosion due to poor watercourse crossing design may be occurring. This enables other empirical analyses, such as the review of aerial photographs or field observations, to focus on potential “trouble spots.” Monitor each crossing consistently to determine its performance and the appropriateness of the crossing design to the crossing setting.

Determine volumetric values necessary for proper watercourse crossing design by using hydrologic data from stream gauges, weather stations, and snow surveys within each watershed or sub-watershed. Public entities such as the USGS, NOAA, and DWR collect this data from many California watersheds. More location-specific data may be needed, which can be obtained by stream gauging and use of precipitation gauges.

2.5.2.1.5 Erosion Potential Modeling

Several computer-based erosion prediction models are readily available online and free of charge to users. Use of erosion prediction models is not required for the development of a Soil Conservation Plan but can be a valuable tool for analytically identifying background erosion rates and areas that are prone to erosion. A few of these models are briefly discussed below and describe the settings and situations where use of each model would be applicable. More detailed information and instructions for each model are available online at the web addresses provided.

Revised Universal Soil Loss Equation (RUSLE) 2. RUSLE2 is a predictive model of water erosion, developed by the USDA from previous models and released in 2003. The model can be applied to small or large landscapes with various conditions, including vegetation and land use activities. Erosion modeling with RUSLE2 is limited to sheet and rill erosion. Sheet erosion occurs when excess water removes surface material relatively evenly from a wide area, whereas rill erosion occurs when excess water removes surface material along defined depressions, or channels, generally less than 30 centimeters deep. RUSLE2 is an entirely Windows-based environment where all calculations are made within that environment. RUSLE2 validation is from 10,000 plot-years of data from natural runoff plots and 2,000 plot-years of rainfall simulated plots. Daily soil loss rates are predicted based on the relationship between rainfall/runoff (erosivity factor), soil erodibility, slope length, slope steepness, cover-management and supporting practices. Each of these factors is discussed in more detail in the RUSLE2 User's Reference Guide, available at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/tools/rusle2/?cid=stelprdb1247278. The User's Reference Guide provides more information about how to select input values, make erosion estimates for a wide range of conditions, interpret the computed values, and how to evaluate the model's suitability for erosion control planning. The model, database and instructions are available for download at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/tools/rusle2/?cid=stelprdb1247274.

The California Department of Transportation (Caltrans) has developed a modified RUSLE2 model, **Caltrans RUSLE2**, which is suited for large roadway construction projects. Caltrans RUSLE 2 allows the user to predict pre-construction erosion rates and to select construction and post-construction soil stabilization and sediment control

Best Management Practices (BMP) and revegetation techniques. The model gives the user the ability to use a measurable process to select a suitable combination of permanent and temporary BMPs for soil stabilization and sediment control during the construction and post-construction project phases. More information and a link to download software are available at https://dot.ca.gov/programs/design/hydraulics-stormwater/bsddd-erosion-prediction-with-rusle2.

Geomorphic Road Analysis and Inventory Package (GRAIP) and GRAIP_Lite. GRAIP and GRAIP_Lite are both created for use within ArcGIS. GRAIP is a detailed road inventory procedure and model, combining analytical tools with an inventory process, to predict erosion and sedimentation loading in waterways from roads and trails. GRAIP uses observations to determine flow path, vegetation, connection, drainpoint(s) and road segment locations on a relatively small scale (20 – 50 square-kilometers). The package includes approaches to inventory roads and evaluate the inventory for surface erosion, gully risk, landslide risk and stream crossing failure risks. Additional resources and GRAIP software can be downloaded from https://www.fs.fed.us/GRAIP/.

GRAIP_Lite is a more general prioritization tool that can be applied over a broader area (subwatershed) and does not require the same intensive field data as GRAIP. GRAIP_Lite utilizes DEMs, already existing road GIS layers, and a small field calibration dataset to estimate flow path, vegetation, stream connections, drainpoint(s), and road sediment production and delivery. GRAIP_Lite can be used to prioritize smaller areas for more detailed analysis. Additional resources and GRAIP_Lite software can be downloaded from https://www.fs.fed.us/GRAIP/GRAIP_Lite.html.

Water Erosion Prediction Project (WEPP). WEPP is a process-based model that predicts soil erosion from water and can be used to predict sheet and rill detachment and deposition, as well as channel detachment and deposition. Channel erosion occurs when excess water removes surface material along defined depressions, or channels, generally deeper than 30 centimeters. The model is applicable to areas tens of meters for hillslope profiles, and up to hundreds of meters for small watersheds, where multiple hillslopes, channels and impoundments can be linked together. The install package, available at https://www.ars.usda.gov/midwest-area/west-lafayette-in/national-soil-erosion-research/docs/wepp/wepp-downloads/, includes the prediction model, Windows-based interface, climate models, and data for more than 20,000 types of soils. More information about WEPP can be found at https://www.ars.usda.gov/midwest-area/west-lafayette-in/national-soil-erosion-research/docs/wepp/research/.

The US Forest Service has also developed user-friendly WEPP interfaces that can be utilized to predict erosion and sedimentation by water on insloped and outsloped roads. A single road can be modeled using **WEPP:Road**, and multiple roads and road segments can be modeled using **WEPP:Road Batch**. The US Forest Service WEPP interfaces are available for download at https://forest.moscowfsl.wsu.edu/fswepp/.

Wind Erosion Prediction System (WEPS). WEPS is a series of linked, process-based models that simulate weather, field conditions, management, and soil loss/deposition within a single field (trail/road or project area/management unit) or multiple, adjacent fields over a selected period of time. Vegetation or lack of vegetation and repeated disturbance by vehicle use can also be simulated in the model. More information about WEPS and a link to download the software can be found at https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/tools/weps/.

2.5.2.2 Field Surveys and Visual Inspection

Visual inspection of trail, road, and open riding areas of OHV facilities and collecting information on problematic conditions is a fundamental approach to informing management and maintenance needs. Systematic and routinely conducted inspections which track changes due to use and erosion are most effective and allow identification of issues as they arise.

2.5.3 Maintenance Planning

Consistent observation and appropriate preventative action are the basis for conducting proper maintenance of trails and roads at an OHV facility. Ensure appropriate equipment is used for maintenance tasks, from heavy machinery to shovels. Ensure personnel operating equipment used in maintenance activities are sufficiently experienced, competent, and, as appropriate, qualified to use of the equipment.

To ensure consistent, appropriate maintenance is conducted at an OHV facility, a Maintenance Plan needs to be developed and implemented by the OHV facility manager. Modify the Maintenance Plan over progressive seasons to address chronic maintenance problems and the need to change maintenance approaches in some areas of the facility.

2.5.3.1 Maintenance Planning and Implementation

The assessments described above aid in the development of a maintenance plan by providing data needed to identify areas prone to issues that require maintenance to meet compliance with the Standard. Based on maintenance needs, Management Units can be delineated, modified, or divided into Management Sub-units. Below are considerations for developing a maintenance plan and conducting general maintenance activities.

- Considerations in the development and implementation of a Maintenance Plan
    - Ensure the Maintenance Plan provides a process to rectify deficiencies in trail design or construction, as well as changing impacts to the trail such as increased trail use, for example.
    - The consistent documentation of observations and fieldwork conducted as part of an OHV facility Maintenance Plan can form the basis of an ongoing

road and trail monitoring program (discussed in more detail in Section 2.5.4)
    - Ensure the Maintenance Plan is available to all pertinent personnel so that maintenance activities can be coordinated, conducted and documented properly.
    - Provide documentation of a Maintenance Plan and an example of documentation of maintenance activities within the SCP.
- Considerations for general maintenance activities
    - Conduct maintenance for OHV trails with deference to the skill rating of the trail. An expert trail may look “ugly,” to the casual observer but this may be due to features on the trail that qualify it for an expert skill rating. Maintenance may not be needed on such a trail if it is stable and not creating drainage or sedimentation problems and is otherwise in compliance with the Soil Conservation Standard.
    - At failed drainage structures, Determine the cause of failure before repairs are initiated. This may require input from qualified experts.
    - Do not conduct maintenance that entails compaction of soil if soil moisture is too wet or too dry.
    - Remove and use sediment that has accumulated in trail waterbreak (e.g., rolling dips, sediment basins/ponds/traps) for trail structure needs, such as rebuilding the crests between rolling dip troughs.
    - Minimize or eliminate outside berms. However, do not “blade” off the trail as sidecast. Berm materials should be pulled back and graded into the trail tread.
    - Repair rills and gullies in trail treads with soil reclaimed from waterbreak outlets and outside berms. Soil should not be scraped from the trail tread to fill rills and gullies.
    - Smoothly grade soil and rock that may have sloughed onto a road or trail from a roadcut to make a safe trail. The earth materials should not necessarily be removed because they may be providing a stabilizing buttress to the roadcut. In some cases, analysis by a qualified expert may be needed.
    - Conduct repair of “whoops” or “stutter” bumps by ripping the trail tread and regrading.
    - Conduct any road or trail maintenance objective by moving the smallest amount of soil necessary to meet the objective.
    - Evaluate the need for maintenance with mechanical equipment before equipment is mobilized to the maintenance site.
    - Transport maintenance equipment across sections of trail that do not need maintenance without impacting those sections.

2.5.3.2 Documentation of Maintenance Activities

Documentation of scheduled maintenance activities allows for a more thorough evaluation of the effectiveness of the maintenance. Basic information to track with regard to OHV facility maintenance includes the type of equipment used, the operator of the equipment, the frequency of use, and the weather conditions at the time of use. For more examples of the type of information to document, trail maintenance forms are presented in Appendix 2 and Appendix 3 of these guidelines. It may be beneficial to have appropriately trained and qualified earth science professionals, such as soil scientists, hydrologists, or geologists, evaluate the effectiveness of maintenance activities. DPR and the California Geological Survey have specialists who can assist with these evaluations.

2.5.4 Monitoring Techniques

In general, the best type of monitoring of an OHV facility is an assessment that follows the repair and maintenance efforts undertaken based on an initial assessment of the OHV facility. The purpose of the follow-up assessment is to ensure that all fixes applied to an OHV facility based on the first assessment are functioning properly. Perform assessments at the beginning and end of the typical recreation season for the area. Specific to SVRAs, PRC 5090.13 stipulates that monitoring programs provide periodic evaluations of the condition of resources and informs adaptive management.

2.5.4.1 Trail Condition Evaluation

The condition of OHV trails can be systematically evaluated using various versions of the Trail Condition Evaluation Form. This form can be used for an initial assessment of the condition of a trail or trail system. Repeated trail evaluations using the form will allow for monitoring of changes in trail conditions over time. A generic version of the Trail Condition Evaluation Form can be found in Appendix 2. General criteria for using the form are listed below.

- Prior to conducting the fieldwork using the form, obtain and review information on the management of the OHV facility, the history of the facility and trail network, the current trail maintenance schedule and type of maintenance conducted, trail usage, skill rating assignments, existence of multiple-use roads, etc.
- Trails are evaluated in segments. A trail segment is defined by the user of the form as any length that is practical and meaningful for monitoring.
- Consistently apply criteria for making trail segments over the entire trail network.
- The primary purpose of the form is to identify trail segments which need more focused maintenance or reconditioning. Data collected from the form also provides the basis for a monitoring program.
- To assist in consistent data entry on forms used at an OHV facility, the facility manager is encouraged to develop a series of facility-specific calibration cards.

These cards consist of photographs of typical Green (acceptable), Yellow (marginal), and Red (action needed) conditions that might be found at the facility.
- Pay attention to where the trail is adjacent to or crosses a watercourse. Evaluate trail intersections carefully so that one path is not negatively affecting the other.
- Off-trail or off-site impacts may require a more detailed evaluation by an appropriately qualified professional.

Other technologies that could be used in lieu of a paper form for trail assessment work include satellite imagery, geographic information system (GIS) software, global positioning system (GPS) devices, and aerial drones for acquiring more detailed aerial imagery and associated data. When these and similar technologies are employed however, an unwieldy amount of data may be collected. If the data are not properly managed and archived, the trail assessment intent of the data collection may be lost. For that reason, it is important to identify a system for managing the documentation of the trail assessment data before any field effort to collect data is conducted. When employing technology, such as GIS or GPS, to assess the condition of a trail, be sure to reference the Trail Evaluation Form to ensure appropriate data are being collected.

2.5.4.2 Soil Conservation Plan – Monitoring Section

Include a monitoring section within your SCP and design it so that it can be implemented effectively and conducted consistently within the constraints of budget and staff capabilities. Effective monitoring sections shall include:

- A Schedule of Monitoring Activities – Specific monitoring activities shall be scheduled as appropriate—quarterly, seasonally, before or after peak use of the OHV facility, etc. Monitoring activities shall also be prioritized based on potential detrimental impacts from feature failure and on available personnel.
- General Field Observations – Tour the OHV facility throughout the year to determine if monitoring schedules need to be modified or if additional features should be monitored. Observations to determine feature functionality are best made during or shortly after seasonal extremes, and during peak use of the OHV facility.
- Monitoring Data – Stipulate the type of data that is to be gathered from the monitoring activities and how the data are to be collected and recorded. Appropriate selection and training of monitoring personnel will ensure that data are collected in a consistent manner.
- Instruction for Appropriate Management of Collected Data – The monitoring plan should also describe the data management system for monitoring activities—how collected data will be stored, managed, and accessed for future uses. Databases are often used as data management systems because they can be customized to store different types of data and can integrate with GIS software. GIS software enables versatile geographic representation of collected data. Conduct data entry into a data management system concurrent to fieldwork or shortly thereafter.

- Photo Point Monitoring – This technique monitors specific trail locations using photographs. A specifically sensitive area may be chosen for photo point monitoring. A photograph or photographs, along with the date-taken information, can be taken to show, in essence, before, during, and after conditions of the sensitive trail segment. Photos should include the direction of view and a brief description. In practice, this technique is rarely implemented effectively and typically results in a collection of photographs with little or no context. If a trail segment has already been identified as a sensitive location worthy of photo point monitoring, then the trail design and use should be examined to determine if a design change or other mitigation is warranted.

Some environments, and some OHV activities, should have monitoring suited to the specific environment or activity, as detailed below.

- Monitoring Open Ride Areas – Open-ride areas are expansive areas where OHV use is not limited to specific routes. Almost any portion of an open-ride area may become impacted by excessive OHV traffic. The following tiered monitoring approach will allow adverse impacts in and adjacent to the open-ride area to be identified. One or all tiers may be used based in specific OHV facility needs.
    - Tier one: Monitoring of the open-ride area. Focus monitoring on the interaction of the open-ride area and its surrounding non-open-ride areas, at this level.
    - Tier two: Monitoring areas of concentrated OHV activity and general use. Focus monitoring of staging areas, camping areas, and specific OHV recreation features such as hill climbs, at this level.
    - Tier three: Monitoring specific features. Focus monitoring on specific common riding sections with potential erosion problems, watercourse crossings, and environmentally sensitive areas, such as habitat for endangered plants and animals, at this level.
- Monitoring Dunes and Desert Sand Environments – Design monitoring activities specifically to evaluate impacts of OHVs on sensitive areas within the dune and desert sand environments. Any monitoring effort should acknowledge and be designed to account for, as appropriate, factors such as wind transport of sediment and seasonal deluging from desert washes.
- Monitoring for OHV Special Events and Races – Special events and races at an OHV facility can strain the infrastructure and environment at the facility. This is because concentrated numbers of people congregate for the events, and in many cases aggressive, repeated runs occur on the event courses by competitors. OHV courses for special events and races are designed as either point-to-point routes or are on closed-loop routes. Competitions include cross-country races, enduros, dual sports, hare scrambles, hare-and-hound races, trials riding, rock climbs, obstacle course contests for four-wheel-drive vehicles, and motocross races on closed-loop courses. Some monitoring considerations for OHV special events and races include:

    - Conduct pre and post event inspections and include special event course monitors.
    - Runoff drainage monitored for volume and sediment load at fixed facilities, such as tracks and staging areas. Monitoring results may determine the need for runoff drainage holding facilities (i.e. sediment basins/ponds/traps).
    - Consider climate prior to an event. Among other concerns, it may be necessary to postpone or cancel an event due to excessive precipitation.
    - For temporary facilities, such as cross-country racecourses, monitoring at select watercourse crossings may be warranted to ensure potential adverse impacts are avoided.
- Air Quality
    - The California Air Resources Board website (www.arb.ca.gov) provides contact information for Air Quality Management Districts and Air Pollution Control Districts throughout the state. These districts will have information about local air quality concerns that may apply to OHV areas.
    - General mitigation measures may be needed at an OHV area for dust control depending on proximity to potential receptors.
    - A careful evaluation of all sources impacting air quality within the region of an OHV facility, including natural sources such as wind-blown dust, may be warranted prior to any other consideration.

2.5.4.3 Developing a Monitoring Plan

As part of the monitoring protocol, develop a Monitoring Plan that effectively detects changes at an OHV facility. The most effective Monitoring Plan employs consistent, continued assessment of OHV trail and facility conditions. To achieve this, stipulate within the Monitoring Plan:

- Monitoring Objectives – Ensure the purpose of the monitoring effort is clear. Monitoring objectives should discern if the features of an OHV facility are functioning properly.
- Monitoring Parameters and Site Selection - The Monitoring Plan stipulates the features to be monitored, and the approach to monitoring. The scope of the monitoring effort should be appropriate to the size, type, and use of the OHV facility and be manageable within the limits of facility staff and budget.
- Consider the following types of monitoring when developing monitoring parameters:
    - Implementation Monitoring - determines whether activities were conducted as planned.
    - Forensic Monitoring - identifies causes of acute erosion and sedimentation.
    - Effectiveness Monitoring - determines whether design, construction, and maintenance practices are adequate.

    - Compliance Monitoring - determines whether land-use activities are in compliance with applicable regulatory standards.
    - Assessment and Trend Monitoring – Consider characterizing existing conditions, and maintenance planning (as discussed in Section 2.5.3 of the Guidelines) when scheduling monitoring activities.
- Use Trained and Qualified Personnel - Personnel charged with conducting monitoring activities may need specific training and qualifications to conduct specific tasks.
- Schedule of Monitoring Activities – Schedule specific monitoring activities as appropriate—quarterly, seasonally, before or after peak use of the OHV facility, etc. Prioritize monitoring activities based on potential detrimental impacts from feature failure and on available personnel. Consider maintenance planning (as discussed in Section 2.5.3 of the Guidelines when scheduling monitoring activities).
- General Field Observations – tour the OHV facility throughout the year to determine if monitoring schedules need to be modified or if additional features should be monitored. Observations to determine feature functionality are best made during or shortly after seasonal extremes (e.g. post storm events, snow melt), and during peak use of the OHV facility.
- Proper Data Collection Techniques, with Quality Assurance/Quality Control measures (QA/QC) – stipulate within the Monitoring Plan what type of data is to be gathered from the monitoring activities and how the data are to be collected and recorded. Appropriate selection and training of monitoring personnel will ensure that data is collected in a consistent manner. A small percentage of duplicate sampling by different individuals (generally about 10 percent) will provide a QA/QC check on the data collected.

2.5.5 The Compliance Report and Action Plan Portions of a Soil Conservation Plan

It is important to note that a SCP is an iterative document, assembled in multiple stages as a project progresses from design through completion. The SCP also acts as a bridge between past and future SCPs. At its initial stage, a SCP provides a record of assessed conditions within a defined Project Area/Management Unit(s), a statement detailing the proposed project based on the assessed conditions, and also an indication of anticipated activities related to maintenance and monitoring of the Project to ensure the project will function in accordance with the 2020 Standard. As the Project progresses, maintenance and monitoring activities should be documented so that a representative record of those activities can be incorporated into the SCP.

At the completion of a Project for a grantee, or annually for an SVRA, a Compliance Report is to be prepared and submitted to ensure compliance with the SCP. For SVRA's the Compliance Report may be specific to MU's in which ground disturbing activities took place that year. The intent of Compliance Report is to document that any ground disturbing activity has been completed as specified at the start of the SCP, before the activity was initiated.

The Compliance Report contains within it an Action Plan. The Action Plan represents a "to do" list of anticipated activities related to the Project and/or indicates possible upcoming Projects involving ground disturbing activities to be conducted within an OHV facility to ensure compliance with the 2020 Standard. If a Project as specified in the initial iteration of the SCP is not completed in entirety, an explanation which details circumstances that prevented Project completion is to be provided as part of the Compliance Report. Those aspects of a Project that were not completed should also be included as anticipated items to complete as listed in the Action Plan section of the SCP.

Aspects of the Compliance Report and Action Plan portions of a SCP are detailed below, excerpted from CCR Title 14, Division 3, Chapter 15 of the CCR, subsection 4970.06.3 (h):

(1) Change analysis, such as quantifying trail condition improvements by contrasting initial and subsequent trail assessments.

(2) Documentation of maintenance activities within the Project Area/Management Unit.

(3) Documentation of Project Area/Management Unit(s) infrastructure improvements, such as the repair of a trail watercourse crossing proposed in the initial Grant Application for grant recipients, or proposed by SVRAs.

(4) A Compliance Action Plan, which includes:

(A) A list of planned actions to be taken at an OHV Facility in consideration of continued adherence to the Soil Conservation Standard, and

(B) a description of an area or areas within an OHV Facility where future Projects are to be performed, including a brief description of the planned work.

2.6 Considerations for Practice: Project Design and Construction

2.6.1 Previous Land Use and Hazard Consideration

Research reference maps and other data regarding previous land use within and adjacent to an OHV facility's boundaries. Previous land use data such as mining operations, military operations, and agricultural activities, provide an important historical record. This information may be important to an OHV project, particularly if the project requires disturbance of soils, as previous land uses may not have been designed for long-term sustainable OHV use. Identifying natural hazards such as potentially hazardous minerals (e.g., arsenic, asbestos, mercury), as well as landslides and active faults, is an important preliminary step to take when assessment activities for an OHV project are initiated.

Many former land uses and geologically hazardous conditions pose health and safety concerns. When evaluating lands with potential hazard- and health-related concerns, the OHV manager should consider retaining the assistance of a specialist trained, and as appropriate, licensed, to assess the applicable standards. Examples of specialists for certain areas include: abandoned mine land assessment, hazardous minerals assessment, industrial hygiene, and unexploded ordinance on formerly used defense sites. Personnel should not conduct field evaluations of such lands unless appropriately trained and/or accompanied by trained personnel familiar with the potential hazards at these types of facilities. Depending on concerns, evaluations regarding previous land use and hazard considerations should:

- Identify former mine sites located within and near an OHV facility, including the excavations, abandoned equipment, and tailings from the mine operations that may present physical or exposure hazards to OHV users. Mine tailings may also present special erosion control considerations and/or environmental hazards to a watershed.
- Utilize services from a licensed (as legally applicable) geologist or engineering geologist, with expertise in erosion control, to assist in identifying and assessing potentially hazardous features, such as landslides and active faults. When possible, such features are best avoided. If such sites cannot be avoided, then special considerations may be necessary to comply with applicable state and federal laws.
- Utilize services from an appropriately trained and, as applicable, licensed professional to identify and address potentially hazardous minerals, such as asbestos and mercury. If such areas cannot be avoided, then special considerations may be necessary to comply with applicable state and federal laws.
- Identify any industrial operations that used hazardous materials that may remain on the land or in the groundwater.

- Identify areas where military operations were conducted that may contain hazardous materials and unexploded ordnance.
- Identify past animal grazing and agricultural uses that, where excessive, may hinder vegetation from becoming established.
- Document the locations of the above features on a map. Include records of what the land use was, when it occurred, where it occurred, what human and/or environmental hazards may have been created, to what extent remediation was undertaken.
- Indicate whether the previous land use presents a current hazard or concern to OHV facility operations and erosion control.
- Provide a safety rationale and written record for limiting access in certain areas of the OHV facility.

2.6.2 OHV Area Visitor Information

OHV area facility managers should know basic information about the visitors who frequent their OHV areas. This information is important to discern if a facility and its design are meeting the needs of the recreationists. If the facility is designed for the user with intermediate skills but frequented by expert riders and drivers, volunteer trails may be created by recreationists looking for more challenging routes. Conversely, beginning riders may jeopardize their safety when recreating within a facility designed predominantly for more skilled riders. To determine skill levels and other demographic data from the people who visit OHV areas, user information may be obtained in accordance with applicable state and federal agency policies and procedures. Regardless of whether survey data is available, consider the following demographic questions before proposing and implementing an OHV project at an OHV facility:

- What type(s) of vehicles access the area of the project?
- What is the rated skill level(s) of the trails and/or roads where the project is proposed?
- Are there other activities in the area of the project and should the design of the project consider these activities?
- What is the percentage breakdown of skill levels—beginner, intermediate, advanced—of the current users of the OHV facility, and how does that compare to the percentages of corresponding skill-rated trails, roads, and areas at the facility?
- With regard to staging areas, campgrounds, and parking, what are the percentage of day users at the OHV facility and the corresponding percentage of users who stay overnight?
- What are the desired future OHV opportunities at the facility?

2.6.3 Use of Best Available Science Soil Conservation Plans

Best available science is defined by multiple criterion including relevance, inclusiveness, objectivity, transparency and openness, timeliness, and peer review (Sullivan et al. 2006, NRC 2011). For science to be relevant, it must be related to the activity under consideration. Inclusiveness requires that a comprehensive review of existing information has been completed, using a variety of sources. Best available science is specific to the management activity and evolves over time requiring management activities to be re-evaluated over time. Using best available science ensures that the most robust information and data inform soil conservation management activities (Sullivan et al. 2006).

Approaches to using best available science rely on peer-reviewed data and information, agency-published technical reports, best available information obtained from systematic inventory and monitoring data, and professional expertise and experience (Delta Stewardship Council 2015, DPR DOM 2004, Ryan et al. 2018).

2.6.3.1 Updating the Soil Standards and Guidelines with Best Available Science

PRC 5090.39(a)(1) requires best available science to be applied to the Standard and any monitoring program. The Soil Standard and Guidelines were developed using best available science as follows:

- Natural resource managers of State, federal, and local OHV facilities were sent a survey in January of 2020 to solicit feedback and data on technical and policy issues for updates to the 2008 Standard and Guidelines document. Survey responses were documented, summarized, and considered in revisions.
- DPR conducted a literature review to address new technologies and data available to land managers, and to address the need for more guidance on design and assessments.
- The 2020 Standard and Guidelines update process included review by a Consulting Agency Review Committee, and incorporated feedback and revision based on this review.

2.6.4 Critical Existing Resources

The San Diego State University Erosion Control Laboratory, California State University at San Luis Obispo, and the Shasta College Erosion Control Training Facility are developing and testing new BMPs, especially designed for California. Presented below are Internet resources, manuals and guides, and peer-reviewed articles that are useful in planning, design, construction, maintenance and monitoring of OHV areas.

US Department of Transportation, Federal Highway Administration: Publications (web page). This webpage is provided by the US Department of Transportation, Federal Highway Administration, providing a compilation of publications and other resources to access trail references. The webpage provides links to trail planning publications; design, construction, and maintenance guides; US Forest Service publications; and other recommended publications.

The Link to the US Forest Service Trail Publications include useful documents, such as:

- USFS Trail Construction and Maintenance Notebook Tread, Surface water control and trail drainage, tread, water crossings Effects of All-Terrain Vehicles on Forested Lands and Grasslands (USFS) - recreation, including the latest in OHV technology,
- Geosynthetics for Trails in Wet Areas: 2008 Edition (USFS) Geosynthetic material evaluation, - example of geoblocks on ATV trail
- Off-Highway Vehicle Trail and Road Grading Equipment (trail construction and maintenance equipment), - guidance for selecting trail and road grading equipment

The web page is located at https://www.fhwa.dot.gov/environment/recreational_trails/publications/

National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide, FS-990a (2012). This technical guide is for the Forest Service, U.S. Department of Agriculture, National BMP Program to provide a standard set of core BMPs and methods to track and document the use and effectiveness of BMPs for water quality. The guide addresses recreation management activities, such as motorized trails (Rec-4) and motorized vehicle use areas (Rec-5), and road management activities, such as construction (Road-3), maintenance (Road-4) and stream crossings (Road-7). The guide also includes references to relevant USFS manuals, USFS handbooks, and other publications. The guide is accessible at https://www.fs.fed.us/biology/resources/pubs/watershed

Low-Water Crossings: Geomorphic, Biological, and Engineering Design Considerations (2006). This publication reviews the advantages and disadvantages of various low-water crossing structures in different stream environments. The document also provides numerous illustrations and photographs of low-water crossing designs and addresses various situations in which low-water crossings may be the ideal choice of crossing structure. The document is accessible at https://www.fs.fed.us/eng/pubs/pdf/LowWaterCrossings/LoWholeDoc.pdf

Managing Degraded Off-Highway Vehicle Trails in Wet, Unstable, and Sensitive Environments, 2E22A68—NPS OHV Management, K.G. Meyer (2002). This document discusses soil and soil erosion basics, trail condition assessments, maintenance and monitoring, trail hardening and trail rerouting. This document is accessible at https://www.fs.fed.us/t-d/pubs/pdfpubs/pdf02232821/pdf02232821dpi72.pdf

Designing Sustainable Off-Highway Vehicle Trails: An Alaska Trail Manager's Perspective, Project number 8E82A76, K.G. Meyer (2013). This document, published in cooperation between USFS and National Parks Service, provides tools and resources for the construction and management of OHV trails. It presents a framework for a step-by-step approach to sustainable OHV trail management, including trail design and management concepts. The document is accessible at https://www.fs.fed.us/t-d/php/library_card.php?p_num=1123%202804P

Environmental effects of off-highway vehicles on Bureau of Land Management lands: A literature synthesis, annotated bibliographies, extensive bibliographies, and internet resources, Open-File Report 2007-1353 (2007). This report presents a comprehensive literature and Internet search, conducted by the US Geological Survey in May 2006, and review of hundreds of peer-reviewed papers, magazine articles, agency and non-governmental reports, and websites regarding effects of OHV use. OHV effects on soils, watersheds, vegetation, water quality and air quality are addressed. Indicators of each OHV effect, as well as mitigation and site-restoration techniques, were analyzed and are presented in the report. The report is accessible at https://pubs.er.usgs.gov/publication/ofr20071353

State of California, Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation Division, OHV BMP Manual for Erosion and Sediment Control (2007). The manual provides guidance for selecting and implementing best management practices (BMPs) at OHV Areas. The manual was specifically written for Carnegie SVRA but offers methods to minimize the impacts of erosion, sedimentation, and other non-stormwater pollutants on water quality. The manual includes all of the new, appropriate, and state-of-the-art BMPs as of 2007 and excludes the BMPs that have proven ineffective. It is accessible at https://ohv.parks.ca.gov/pages/25010/files/ca_dpr_ohv-bmp-manual_nov2007.pdf (by request).

National Off-Highway Vehicle Conservation Council Great Trails: A Guide to Providing Quality OHV Trail Experiences (2015). This manual is intended to guide trail managers in OHV trail layout, design, construction and maintenance. The manual is available for purchase (for non-members) at https://www.nohvcc.org/nohvcc-initiatives/blm/

Switalski, A. 2018. Off-highway vehicle recreation in drylands: A literature review and recommendations for best management practices. Journal of Outdoor Recreation and Tourism 21 (2018) 87–96. In this article, the author reviews BLM travel and resource management plans, BLM Travel and Transportation Management Hanbook, USFS National Core BMP Technical Guide, and USFW species recovery plans. Tables 2 through 6 of the article outline BMPs for erosion, vegetation, wildlife, social impacts, and cultural sites. The article is available at https://www.sciencedirect.com/science/article/pii/S221307801830001X?via%3Dihub

Switalski, J. and A. Jones. 2012. Off-road vehicle best management practices for forestlands: A review of scientific literature and guidance for managers. Journal of Conservation Planning Vol 8 (2012) 12-24. In this article, the authors review recent research on the environmental and social effects of OHVs in forested landscapes. Included are soil compaction and erosion research, stream sedimentation research and proposed BMPs for soil to minimize OHV impacts. This article is publicly accessible at https://pdf.wildearthguardians.org/site/DocServer/4%20Off-road%20vehicle%20best%20management%20practices%20-%20Switalski%20%26%20Jones.pdf

2.7 Specific Guidance for Project Design and Construction

The purpose of this section is to provide basic design criteria that should be considered when an OHV Project is proposed and constructed. The intent of all design criteria discussed is to prevent or limit erosion and to promote soil conservation at OHV facilities.

2.7.1 Project Design Considerations

The design of an OHV project should not significantly alter or impact the local watershed where the project is proposed--watercourses, hill/slope runoff, native vegetation and spread of invasive species should be minimally affected. To achieve this ideal, design OHV projects using the principles of hydrologic invisibility and hydrologic disconnection.

An OHV project designed with the principles of hydrologic invisibility allows runoff water to flow in a natural pattern down a slope and across the trail or road tread surface—not along the tread—as it continues downslope. Thus a hydrologically invisible trail or road avoids unnatural concentration of flows, and disperses concentrated runoff before it accumulates to volumes and velocities that can cause erosion. A project designed for hydrologic disconnection incorporates design elements of hydrologic invisibility on network-wide level to ensure water in a watershed or subwatershed exits the watershed basin naturally, at the low point, or mouth, of the basin. Ridge tops and stream crossings are critical points for maintaining hydrologic disconnection: The lowest point of any trail or road in a basin should be at the watercourse crossing. If this is not the case, then the trail or road network has the potential to intercept and divert water from the natural channel. The highest point of any trail or road that traverses a ridge should be at the point where the trail or road intersects with the ridgeline. This ensures that runoff water will still flow away from the ridgeline, keeping adjacent watersheds disconnected. Aspects to consider regarding physical setting and layout of roads and trails are detailed below.

- OHV Trails and Roads—General Design Considerations

    - Design trails and roads to follow the principles of hydrologic invisibility which are less susceptible to erosion.
    - Design features which promote hydrologic invisibility include outsloping, rolling tread profiles, and rolling dips.
    - Use alternatives that better adhere to the principles of hydrologic invisibility and disconnection, rather than culverts, inside ditches, and similar drainage control features that require frequent maintenance and hinder the sustainability of trails and roads.
    - Design trails or roads with varying grades, avoiding sustained uniform grades, including level or near-level grades. Runoff water will flow along a sustained grade, gaining velocity, volume, and erosive force.
    - Design layout and grade of a trail or road to minimize the creation and size of cuts made into the natural grade of the landscape (cut-slopes). Consult an engineer or geologist to determine the suitability and stability of larger, steeper cut-slopes.
    - Design trail and road networks to avoid known unstable areas such as landslides and earthflows. Trails and roads crossing unstable ground typically require extraordinary construction and maintenance costs. If an unstable area is unavoidable, consult an engineer or geologist to determine proper layout and design of the trail or road.
- Specific Design Considerations - OHV Trails.
  Successful trail design integrates numerous factors encompassing visitor satisfaction, hydrology, trail durability, construction technique, and ease of maintenance. Trail-specific design considerations include:
    - Mix trail types, difficulty, and length to provide visitor satisfaction and potentially minimize the creation of "volunteer" trails byrecreationists.
    - Use loop or connecting trails without "dead end" or major velocity changes at turns solely contained by hillslopes. Both of these conditions can lead to volunteer trails and hill climbs departing from these points.
    - Enhance trail durability by routing the trail over erosion resistant soils and rock.
    - Avoid vertically stacked switchbacks that cause cascading erosion and cumulative sedimentation.
    - Avoid layout designs of closely-spaced parallel trails to prevent "volunteer" trails which connect the parallel trails.
- Specific Design Considerations - Multi-Purpose Roads.
  Multi-purpose roads within OHV facilities must be usable by a wide range of vehicles, including general transportation, utility, and emergency vehicles. Consequently, multi-purpose roads will not typically offer a challenge to the OHV recreationists as they must be designed to allow efficient conveyance of non-recreational vehicles. Some design considerations for multi-purpose roads are listed below.

- Design layout of a multi-purpose road within an OHV for minimal length while still adhering to the principles of hydrologic invisibility and hydrologic disconnection.
- Locate multi-purpose roads on the periphery of an OHV area.
- Runoff from a multi-purpose road should not be intercepted by or otherwise diverted to an OHV road or trail.
- Construct durable surface for multi-purpose roads. Appropriate surfacing with crushed rock, or other road base material and amendments improves load capacity of the road and smooths the running surface of the road.

2.7.2 Designing for Specific (Variable) Environments

Considerations that should be made when designing OHV projects within specific environments and designing for OHV event activities, such as competitions, is discussed below.

- Open-Ride Areas - All or part of an OHV facility that does not restrict OHV traffic to trails and roads is considered an open-ride area. Established routes of travel often exist or become developed within open-ride areas, but almost any portion of an open-ride area may become impacted by excessive OHV traffic. Erosion-related impacts on open-ride areas can be minimized if drainage courses are protected and sediment is kept within the open area boundaries. Specific design considerations include:
    - Assess, design and maintain open-ride areas as an independent facility. The expectation is that some environmental impact will occur from OHV use but that such impacts will not extend beyond the boundaries of the open-ride area.
    - Roads and well-defined trails within an open-ride area should be away from watercourses.
    - Delineate and restrict OHV access to sensitive areas, such as habitat for endangered wildlife and vegetation, cultural and paleontological (fossil) sites.
    - Identify key monitoring points within the drainage network in an open-ride area for subsequent monitoring of potential erosion, sedimentation, loss of riparian habitat or other impact.
    - Conduct an erosion potential assessment on an area being considered for open-ride designation. Conduct a more detailed analysis before considering the use of areas with high erosion hazard for open riding activities. If areas of high erosion hazard lay within existing open-ride facilities, conduct analyses to assess whether OHV traffic should be limited.

  - Evaluate the potential for erosion from water, wind, and/or mechanical forces throughout the facility so that areas that receive concentrated use within an open-ride area, such as near camping and staging areas, are located away from areas that are more naturally susceptible to erosion.
- Dunes and Desert Sand Environments - Depending on conditions, dunes and desert sand environments can be geologically fragile. Recovery of these environments, if damaged, can be lengthy. Dune environments vary and depend on the type of dunes that have developed, wind patterns that affect dune orientation, vegetation diversity, and hydrological conditions. Wind transport is one of the most important factors in the distribution of natural communities within dune and desert sand environments. Dunes and relatively bare areas within desert environments (i.e., sand drifts, blowouts, and wash over fans) should be managed as dynamic (moving) systems. Evaluate stabilization measures specific to OHV use prior to implementation so that potential impacts to these mobile systems is minimized. Other design considerations for OHV recreation in dune and desert sand environments are presented below.
  - Identify the location, type, and extent of dune ecosystems on which an OHV facility may be located prior to designing the OHV project.
  - Assess dune morphology (relative relief, orientation, arrangement, and relationship of the dune assemblages to the underlying geologic formations) prior to designing the OHV project.
  - Delineate and restrict OHV access to sensitive areas, such as habitat for endangered wildlife and vegetation, and paleontological (fossil) sites.
  - Identify cultural and natural resources within or adjacent to a dune or desert environment so that the OHV project can be designed to minimize impacts to the features.
  - Assess potential impacts of OHV use on the dune and desert sand environments.
  - Limit open-ride area OHV activity in vegetated areas.
  - Minimize the location and number of parking areas, campsites, and access routes to reduce potential impact to the environment. Place these OHV facility features on naturally flatter areas to minimize grading.
- Watercourse and Lake Protection Zones - To limit the amount of sediment that is introduced into watercourses, protection zones may be used for limiting OHV activity within the riparian corridor of watercourses, and in other wet areas, such as springs. Guidance for selecting the appropriate protection zone width is outlined in the 2020 California Forest Practice Rules (CDFFP 2020). In summary:
  - Class I Watercourse Protection Zone:
    - <30% slope advises a 75 foot wide protection zone from the closest edge of the watercourse channel.
    - 30-50% slope advises a 100 foot wide protection zone from the outermost bank of the watercourse channel.
    - >50% slope advises a 150 foot wide protection zone from the outermost bank of the watercourse channel.

  - Class II Watercourse Protection Zone:
    - <30% slope advises a 50 foot wide protection zone from the outermost bank of the watercourse channel.
    - 30-50% slope advises a 75 foot wide protection zone from the outermost bank of the watercourse channel.
    - >50% slope advises a 100 foot wide protection zone from the outermost bank of the watercourse channel.
  - Class III Watercourse and other wet areas Protection Zone: width of projection zone varies per project. Protection zone measures may be defined by the OHV facility manager or designee and implemented when the watercourse is visibly flowing (more restrictive) and when it is not flowing (less restrictive). If avoiding a wet area is impractical, then a raised causeway, such as a puncheon structure, may be appropriate. Review section 1.3 for other applicable statues and regulations as they relate to watercourse and lake protections zones.

  Protection zones should be considered when designing new trails or watercourse crossings and in addressing problematic sections of existing trails. Note the Protection Zone widths listed are not intended for OHVs on approach to designated watercourse crossings. These protection zone widths are presented as guidelines for protecting watercourses from sediment which may discharge from trails and roads that run parallel or sub parallel to watercourses. It may be appropriate to narrow or broaden the protection zones depending on the geomorphology of the watercourse banks, and the topographic and vegetative buffers between path and watercourse. If the protection zones are modified from the recommended widths, the modifications should be technically justifiable based on an assessment of the watercourse bank morphology and any other local conditions which may be pertinent.

- OHV Hill Climbs - A “hill climb” in an OHV area is a trail leading straight up a steep slope. Hill climbs generally have gradients of 50 percent or more. Hill climbs are generally 125 feet or more in length and eight to 20 feet wide. Erosion can occur on hill climbs in areas where soils are poorly consolidated and where exposed bedrock, such as decomposed granite, is friable and erodes easily. Design considerations for hill climbs include the following:
  - Place hill climbs on soil or bedrock units that are resistant to erosion.
  - Place no more than two hill climbs every 100 horizontal feet of slope face, as physical setting allows.
  - Place the approach to the hill climb on a relatively flat area, and place the “top” of the hill climb at least 20 feet below the crest of the slope.
  - Ensure runoff drainage does not funnel towards the top of any hill climb.
  - Place hill climbs in such a way that any runoff drainage that may flow down the hill climb does not flow directly into adjacent watercourses.

    - Design hill climb topography and other physical conditions in a way that allows for soil that is eroded from a hill climb to deposit on the landscape no more than 500 feet from the base of the hill climb. These eroded materials can be used for hill climb repair, if necessary.
    - Close hill climbs that are not managed for sustained use to OHV recreation and rehabilitated, as per PRC 5090.02(c).
- OHV Routes for Special Events and Races - The OHV courses for special events and races are designed as either point-to-point routes or closed-loop routes. Competitions include cross-country races, enduros, dual sports, hare scrambles, hare-and-hound races, trials riding, rock climbs, obstacle course contests for four-wheel-drive vehicles, and motocross races on closed-loop courses. Some events are timed while others are based on distances traveled and obstacles encountered. Some OHV areas have training facilities for these events which may also be used for the competitions. Other courses are built specifically for an event. Some considerations when designing OHV routes for special events and races include:
    - Design facilities with consideration of prevailing wind direction, sun angles, noise, and anticipated crowds.
    - Design facilities to keep displaced soils, erosion and sedimentation on site.
    - For cross-country events, clearly mark designated routes with barrier tape. Use exclusion fencing to protect environmentally sensitive areas. Remove route markers and fencing at the conclusion of events.
    - After an event, regrade and restore any temporary tracks to restore natural drainage patterns, and restore native vegetation, if necessary.
    - Consider climate prior to an event. Depending on the type of event and course conditions. For example, it may be necessary to postpone or cancel an event due to excessive precipitation.

2.7.3 Project Design Features

An OHV project is a mix of different design features. Determining which features to incorporate depends on the management objective(s) for that project. Different design features are presented below, along with criteria to consider when incorporating these features into a project.

- Trail Tread Design
    - Base the width of trail tread that is designed for OHV recreation on the type of vehicle expected on the trail (motorcycle, ATV, 4x4), the intended skill rating for the trail (less skilled operators require a wider tread for safety), and the topography on which the trail or road will be graded. Recreational Off-Highway Vehicles (ROVs) tread widths can vary depending upon the make/model and range between 4x4 and ATV tread width. Typical recommended widths are:

DESIGNATED USE	TREAD WIDTH (INCHES)
Motorcycle - most difficult	12 – 18
Motorcycle – more difficult	18 – 24
Motorcycle – easiest	24 – 30
ATV - most difficult	48 – 60
ATV – more difficult	60 – 72
ATV – easiest	72 – 86
4X4 - most difficult	72 – 84
4X4 – more difficult	84 – 96
4X4 – easiest	96 -120

  - To achieve desired trail tread width, the following grading practices, are recommended based on adjacent topography:
    - Integrate the trail tread with designed drainage control measures to retain hydrologic invisibility and hydrologic disconnection.
    - Ensure hydrologic invisibility by not allowing the trail tread to be insloped. Insloped trails capture runoff and promote erosion.
    - Trail tread subject to high usage and/or other potentially intense erosive forces can be protected by treating with a soil amendment and/or armoring with hardened materials such as properly installed paver stones, gravel, or native rock.
    - Because berms are likely to form on the outside edge of a trail, perform periodic maintenance measures to breach the berm at regular intervals or grade the berm material back into the trail tread.
- Rolling Profile
  - The primary benefit of a rolling profile is that it prevents long steady trail grades which capture and convey runoff which would allow runoff drainage to flow, gaining velocity and volume and erosive force.
  - Inclusion and placement of the crests and troughs of the rolling profile is a primary design decision made when a trail or road network is planned for construction or realignment. Troughs in a rolling trail profile are ideal locations for drain dip outlets.
  - Local topography, as well as natural features such as rock outcrops and trees, can be used as “pivot points” on the trail layout, making the trail more interesting and challenging to the OHV recreationist, reducing the temptation to create “volunteer” trails.
- Rolling Dips
  - Rolling dips are broad undulations graded into a trail or road. Rolling dips may be built into a new trail or road, or retrofitted to an existing one. They are usually placed in a series of descending paths so that runoff volume is sufficiently dispersed off the path.
  - Reinforcement measures, such as rock armoring, can be used at the rolling dip trough outlet to minimize erosion.

    - Rolling dips are used for drainage control and should not be considered as features for OHV recreation—they are not intended as jumps for OHVs. Ideally, the trough length of a rolling dip is long enough so that spinning wheels of OHVs do not gouge the trail tread and alter the effectiveness of the rolling dip. Many factors dictate the appropriate spacing and dimensions of rolling dips, road steepness being the most important. The speed of OHV traffic on a trail is also important— design rolling dips dimensions to generally be more elongated with faster traffic. As a general rule, rolling dip troughs should be at least as long as the average wheelbase of vehicles on the trail or road. For example, if a trail is intended for motorcycles only, and the typical motorcycle wheelbase is 55 inches, then the trough flat on a rolling dip should be approximately 55 inches.
    - Rolling dips are nearly always installed in series so that any one rolling dip is not diverting too much runoff, which may lead to an additional erosion problem.
- Waterbreaks
    - A waterbreak is a design feature that diverts concentrated water from a trail or road tread. It may be a ditch, dike, or dip, or a combination thereof, which is constructed diagonally across the trail or road so that water flow is effectively diverted from the tread. Prior to installing waterbreaks it is important to evaluate the conditions that caused the acute erosion. Many times, a water diversionary structure placed strategically on or adjacent to the trail path at the top of a slope can mitigate the problem. The spinning wheels of OHVs eventually obliterate the waterbreaks.
    - Install waterbreaks in a series so that any one waterbreak is not diverting too much runoff, which may lead to an additional erosion problem.
    - Construct durable waterbreaks by mixing soil with rock in the waterbreak core and/or adding a soil amendment such as cement or bentonite. Waterbreaks may also be hardened by positioning pre-formed concrete blocks known as “dogbones”, along the waterbreak crests. On- site materials, such as rock or timber, can be used if sufficient amounts of soil are unavailable.
    - Installation of flexible waterbreaks may be appropriate for some trail conditions.
- Drain Dips
    - A drain dip is a section of the trail that is tilted to a greater extent to facilitate runoff drainage, which are usually cut into the grade of an existing trail or road.
    - Drain dips are typically used on low gradient trails. Use of drain dips can be a very effective drainage control measure on incised trails or roads,
    - Use drain dips where trails run into a swale or hollow in the landscape to promote hydrologic invisibility.
    - Ensure drain dips are routinely monitor and maintain for effectiveness.

- Climbing Turns
  - Design trails to avoid cascading erosion and cumulative sedimentation. Avoid trails with vertically stacked switchbacks, instead employ climbing turns. Climbing turns differ from switchbacks in that they have a larger radius of turn (10 feet or more), with gradients up to 25 percent.
  - Climbing turns are designed with as large a radius as is practicable. The larger the turn radius, the greater the separation distance between upper and lower limbs of the turn. This provides more ground for dispersing drainage.
  - Climbing turns are typically banked. Divert trail drainage that flows around the banked turns from the trail tread immediately above and below the turn, where the trail section between turns is relatively straight. Sufficiently disperse the drainage diverted off-trail so that the drainage does not flow onto any lower portion of trail.
  - Place sequential climbing turns so that the trail grade climbs a slope laterally.
  - Design climbing turns to minimize excavation and cut-slope exposure.
- Watercourse Crossings
  - A properly designed watercourse crossing allows water to remain in the watercourse and does not alter, or only slightly alters, the gradient of the watercourse at the crossing.
  - Design the trail at the watercourse crossing to be lower than the trail segments that approach the crossing on either side, adhering to the principal of hydrologic disconnection discussed earlier.
  - There are many watercourse crossing designs, such as rocked fords, articulated concrete blocks/matting, culverts and bridges. Each watercourse crossing must be designed based on the anticipated flood flows of the watercourse it crosses, and, as appropriate, for aquatic and terrestrial species passage. Not all designs are appropriate for any one crossing.
  - Design approaches to watercourse crossings according to the principles of hydrologic invisibility and hydrologic disconnection to minimize sediment delivery to the watercourses. Incorporate adequate drainage features such as grade breaks, outsloping, waterbreaks, and rolling dips on each approach limb so that runoff water is diverted off-trail and not conveyed along the path to the watercourse. The approaches should not be incised.
- Sediment Basins/Ponds
  - Each sediment basin design must consider the particular site conditions, soil type, drainage area, potential sediment generated, rainfall and runoff and damage potential downstream.
    - Determine basin size for the entire catchment to the basin, not just the disturbed area.
    - Inflow must be directed into the upper end of the basin to prevent “short circuiting”.

        - Make the basin twice as long as wide (except for small basins). Then use baffles, peninsulas, or chambers to increase the L:W ratio to > 5:1.
        - Maximize surface area; shallow depth maximizes trapping efficiency and keeps sediment away from the skimmer.
    - A skimmer will control filling and draining of the basin and help to utilize the surface area and volume to create conditions that will maximize sedimentation.
    - Give careful consideration to pond design and baffle placement so equipment can safely and easily access the pond for clean out.
    - Location of stockpiled sediment after clean-out also needs consideration during the planning and design phase.
- Parking Areas, Staging Areas, and Other Large Surface Areas
    - Parking lots, staging areas, campgrounds and picnic areas, pits at race tracks, and maintenance facilities all have large surface areas which must be drained without causing erosion or excessive soil loss.
    - Options to prevent or limit erosion of a large surface area include:
        - Compaction of earth materials - This option entails scarifying the native surface, applying water to the earth materials as needed for proper compaction of soil, and compacting the soil to an engineering standard based on anticipated loads of the surface area. Typically, soil is compacted to at least 90 percent of the soil's maximum density.
        - Paving - This option is expensive and not appropriate for many settings. Areas to be paved are usually prepared by compaction of earth materials as described above. A compacted crushed rock cover is also applied to the surface before paving if traffic load is anticipated to be heavy.
        - Crushed rock cover - This option is slightly more aesthetic than paving, and cheaper and more easily applied to different settings. Native surface areas may or may not be compacted prior to being covered with crushed rock.
    - Regardless of the surface area treatment chosen, surface runoff should not accumulate excessively as concentrated flow.
    - Design drainage of the surface area to incorporate multiple drainage swales to disperse runoff to multiple locations around the open area.
    - Place rock armor on runoff conveyance and discharge points to avoid erosion during storm events.
    - Use land surfaces that slope gently away from large surface areas to disperse surface area runoff.
    - Consider constructing a runoff control feature, such as a man-made containment or filtering feature, if natural land surfaces suitable for dispersing runoff water are not in the vicinity of the large surface area.

    - Runoff that is discharged to a watercourse may require, at a minimum, a National Pollution Discharge Elimination System (NPDES) permit or waiver.

2.7.4 Construction Practices

Appropriate construction procedures and techniques are required when constructing an OHV project to ensure that the project is sustainable and minimally impacts the environment. Important elements which should be incorporated in the construction of an OHV project are discussed below.

- Construction Equipment
    - Choose equipment and machinery for trail-specific needs.
    - Bull dozers, loaders, road graders and other heavy machinery intended for large-scale earth-moving may not be appropriate for trail construction or maintenance.
    - Specialized earthmoving equipment, scaled for narrow access, is available for OHV trail construction and maintenance projects. A good overview of specialized equipment is presented in Gonzales (1996).
    - Ensure that personnel operating machinery are sufficiently experienced, competent, and, as appropriate, certified in the use of the machinery.
    - Experienced personnel using shovels and other hand tools may be the most appropriate choice for trail construction in some settings.
- Plan Documentation and Construction Control
    - Keep at least one field copy of the plans for the OHV project on site and available for reference by the construction crew and others, as needed, during all phases of construction.
    - Survey and delineate all sensitive areas, such as habitat for endangered wildlife and vegetation, and paleontological (fossil) sites, prior to environmental review. These areas shall be avoided.
    - As-built documentation for a project, including as-built plans, shall be prepared and compiled following completion of the project. Include reasons for changes made to the original design in the as-built documentation.
    - Stake or flag the intended alignment of the path for the grading of a new OHV road or trail. Survey the proposed trail grade elevation and note with stakes or flagging. Ensure the equipment operator reviews the staked or flagged alignment if machinery to being used. Discrepancies between the planned path and actual geography can be visualized with the stakes or flagging, and modifications, if any, can be made before grading is underway.
    - Stake and flag proposed watercourse crossings prior to grading and construction. Key elements of a watercourse crossing to stake include path approach to crossing, path width through crossing, path low point,

gradient across path at crossing point, foundation locations if planned (i.e., bridge). The need for plan modifications can then be discerned before any materials are disturbed. Note modifications for as-built documentation purposes.
    - The OHV facility manager is responsible for updating and maintaining plans and associated documents. This documentation will assist in verifying compliance with the Soil Conservation Standard.

- Compaction of Earth Materials
    - The degree to which earth materials can be compacted is a function of soil type, soil moisture content, and compaction effort.
    - A natural surface that is to be compacted for construction purposes, and which may receive fill for compaction, must first be prepared prior to fill placement. Preparation, at a minimum, includes removing ground vegetation such as brush and grass and excavating below the roots of such plants. Soil that has abundant vegetative matter mixed with it should not be used as fill.
    - Assess the moisture content of the soil, prior to compaction, to determine if the soil moisture is at or near optimum for compaction purposes.
    - Soil will not compact if it is too wet or too dry. An informal method to determine if soil moisture content in a non-rocky soil is near optimum for compaction is to squeeze a handful of the soil. If the handful of soil becomes a clod that holds its shape and can be broken into two halves, moisture content is near optimum for compaction purposes. If the clod crumbles into several pieces, the soil is too dry. If the soil oozes through the fingers, the soil is too wet.
    - Examine soil moisture at several locations and depths. Under field conditions, soil moisture will vary by soil type, depth, and location.
    - Slope angle and orientation, elevation, vegetation, shading, and surface drainage also influence soil moisture content.
    - Soils that consist of sand, or sand and rock, lack cohesion and so the above soil moisture test is not effective for these materials. Nonetheless, these soils drain well and compact well if used to fill a void, such as a steep-sided excavation.
    - Do not use sand or sandy soil with rock for trail tread surfaces because the materials lack cohesion.
    - Scarify and compact the exposed surface to be compacted using appropriate equipment, such as a sheep’s foot roller, the tire tread or track of heavy equipment, or vibrating pad backhoe attachment, assuming soil moisture is optimum.
    - For the placement of compacted fill over a prepared surface, spread fill soil at or near its optimum moisture content onto the surface in “lifts” of six to eight inches, and compacted using appropriate equipment as described above.

- Soil in lifts thicker than eight inches may not be compacted throughout the lift thickness. Lifts that are too thick can “bridge,” where only the upper portion of the lift compacts. Over time, and with OHV traffic, fill with “bridged” lifts will settle, causing misalignment of the trail and low points, which create chronic drainage problems.
- Soil compaction of each lift can be evaluated qualitatively and quantitatively. Compaction can be measured qualitatively using a soil probe or an L-shaped, two- to three-foot length of quarter-inch diameter steel rebar. The probe tip or rebar end at the top of the “L” is placed on the compacted soil surface. The person inspecting the fill compaction leans heavily on the probe crossbar or on the rebar. If the tip sinks more than 3 to 5 inches the fill should be excavated, moistened as needed, placed as a lift and recompacted.
- Quantitative compaction testing entails first determining the maximum density of the soil that is compacted and then comparing that density with the density of the soil compacted in the field. Quantitative compaction testing of this sort requires use of equipment specified by the American Society of Testing and Materials (ASTM) and is usually performed under the supervision of a qualified engineering geologist or engineer. OHV trail projects in general do not need this level of compaction testing, but site conditions and proposed fill thicknesses may necessitate the supervision of a qualified professional and compaction testing according to ASTM standards.
- Haul excess soil materials hauled to a suitable, stable location that is not directly upslope from a watercourse or other water body.
- Earth materials shall not be cast over the downslope side of any trail or road.

Reference List

Ballantyne, M. and C.M. Pickering. 2015. The impacts of trail infrastructure on vegetation and soils: Current literature and future directions. Journal of Environmental Management 164 (2015) 53-64.

Bardi, F., W. Frodellaa, A. Ciampalinia, S. Bianchinia, C.D. Ventisettea, G. Giglia, R. Fantia, S. Morettia, G. Basileb, and N. Casagli. 2014. Integration between ground based and satellite SAR data in landslidemapping: The San Fratello case study. Geomorphology 223 (2014) 45–60.

Bargiel, D., S. Herrmann, and J. Jadczyszyn. 2013. Using high-resolution radar images to determine vegetation cover for soil erosion assessments. Journal of Environmental Management 124 (2013) 82-90.

Brooks, M.L. and B. Lair. 2005. Ecological Effects of Vehicular Routes in a Desert Ecosystem. U.S. Geologic Survey (2005).

California Department of Parks and Recreation, Off-highway Motor Vehicle Recreation Division. 2008 Soil Conservation Standard and Guidelines (2008).

California Natural Resources Agency, Department of Parks and Recreation. Trails Handbook (2019).

Chappell, A., N.P. Webb, J.P. Guerschman, Dean T. Thomas, G. Mata, R.N. Handcock, J.F. Leys, and H.J. Butler. 2018. Improving ground cover monitoring for wind erosion assessment using MODIS BRDF parameters. Remote Sensing of Environment 204 (2018) 756–768.

Ciampalini, A., F. Raspini, D. Lagomarsino, F. Catani, and N. Casagli, 2016, Landslide susceptibility map refinement using PSInSAR data, Remote Sensing of Environment 184 (2016) 302–315.

Custer, N.A., L.A. DeFalco, K.E. Nussear, and T.C. Esque. 2017. Drawing a line in the sand: Effectiveness of off-highway vehicle management in California's Sonoran Desert. Journal of Environmental Management 193 (2017) 448-457.

D'Antonio, A., C. Monz, P. Newmanc, S. Lawson, and D. Taff. 2013. Enhancing the utility of visitor impact assessment in parks and protected areas: A combined social-ecological approach. Journal of Environmental Management 124 (2013) 72-81.

Delta Stewardship Council. 2013. The Delta Plan: Ensuring a reliable water supply for California, a healthy Delta ecosystem, and a place of enduring value (Appendix 1A Best Available Science).

Eagleston, H. and J.L. Marion. 2020. Application of airborne LiDAR and GIS in modeling trail erosion along the Appalachian Trail in New Hampshire, USA. Landscape and Urban Planning 198 (2020) 103765.

Goossen, D. and B. Buck. 2011. Effects of wind erosion, off-road vehicular activity, atmospheric conditions and the proximity of a metropolitan area on PM10 characteristics in a recreational site. Aeolian Research Volume 45, Issue 1, January 2011, Pages 94-107.

Happe, P.J.; Shea, K.E.; Loya, W.M. 1998. Assessment of all-terrain vehicle (ATV) impacts: within Wrangell-St. Elias National Park and Preserve, Alaska. Unpublished Wrangell-St. Elias National Park and Preserve Research and Resource Management Report No. 98-1. Copper Center, AK: U.S. Department of the Interior, Wrangell-St. Elias National Park and Preserve.

Helman, D. and A. Mussery. 2020. Using Landsat satellites to assess the impact of check dams built across erosive gullies on vegetation rehabilitation. Science of the Total Environment 730 (2020) 138873.

"Marion, J.L. and J. Wimpey. 2017. Assessing the influence of sustainable trail design and maintenance on soil loss. Journal of Environmental Management 189 (2017) 46-57."

Marion, D.A, J.D. Phillips, C. Yocum, and S.H. Mehlhope. 2014. Stream channel responses and soil loss at off-highway vehicle stream crossings in the Ouachita National Forest. Geomorphology 216 (2014) 40–52.

Marion, J.L. and Y.F. Leung. 2004. Environmentally Sustainable Trail Management. Environmental Impacts of Ecotourism, Chapter 13 (2004) 229-243. CAB International (ed. R. Buckley).

Meinen, B.U. and D.T. Robinson. 2020. Mapping erosion and deposition in an agricultural landscape: Optimization of UAV image acquisition schemes for SfM-MVS. Remote Sensing of Environment 239 (2020) 111666.

National Research Council, Committee on Defining the Best Scientific Information Available for Fisheries Management. 2004. Improving the use of “Best Scientific Information Available” Standard in Fisheries Management. National Academy Press, Washington D.C. Available from http://www.nap.edu/catalog.php?record_id=11045#toc. Accessed June 2011.

"Olive, N.D. and J.L. Marion. 2009. The influence of use-related, environmental, and managerial factors on soil loss from recreational trails. Journal of Environmental Management 90 (2009) 1483–1493."

Phillips, J.D. and D.A. Marion. 2019. Coarse sediment storage and connectivity and off-highway vehicle use, Board Camp Creek, Arkansas. Geomorphology, Volume 344, 1 November 2019, Pages 99-112.

Ryan, C.M., L.K. Cerveny, T.L. Robinson, and D.J. Blahna. 2018. Implementing the 2012 Forest Planning Rule: Best Available Scientific Information in Forest Planning Assessments. Forest Science 64(2):159–169. https://academic.oup.com/forestscience/article-abstract/64/2/159/4916903 accessed May 2020.

Salesa, D., A. Minervino Amodio, C.M. Rosskopf, V. Garfìb, E. Terol, and A. Cerda. 2020. Three topographical approaches to survey soil erosion on a mountain trail affected by a forest fire. Barranc de la Manesa, Llutxent, Eastern Iberian Peninsula. Journal of Environmental Management 264 (2020) 110491.

Stumpf, A., J.P. Maleta, and C. Delacourt. 2017. Correlation of satellite image time-series for the detection and monitoringof slow-moving landslides. Remote Sensing of Environment 189 (2017) 40–55.

Sullivan, P. J., J. M. Acheson, P. L. Angermeier, T. Faast, J. Flemma, C. M. Jones, E. E. Knudsen, T. J. Minello, D. H. Secor, R. Wunderlich, and B. A. Zanetell. 2006. Defining and implementing best available science for fisheries and environmental science, policy, and management. American Fisheries Society, Bethesda, Maryland, and Estuarine Research Federation, Port Republic, Maryland. Available at http://www.fisheries.org/afs/docs/policy_science.pdf. Accessed June 2011.

Switalski, A. 2018. Off-highway vehicle recreation in drylands: A literature review and recommendations for best management practices. Journal of Outdoor Recreation and Tourism 21 (2018) 87–96.

Switalski, J. and A. Jones. 2012. Off-road vehicle best management practices for forestlands: A review of scientific literature and guidance for managers. Journal of Conservation Planning Vol 8 (2012) 12-24.

Tomczyk, A.M., P.C.L. White, and M.W. Ewertowski. 2016. Effects of extreme natural events on the provision of ecosystem services in a mountain environment: The importance of trail design in delivering system resilience and ecosystem service co-benefits. Journal of Environmental Management 166 (2016) 156-167.

Traglia, F.D., T. Nolesini, A. Ciampalini, L. Solari, W. Frodella, F. Bellotti, A. Fumagalli, G.D. Rosa, N. Casagli. 2018. Tracking morphological changes and slope instability using spaceborneand ground-based SAR data. Geomorphology 300 (2018) 95–112.

United States Department of the Interior, Bureau of Land Management (USBLM). 2001. National Management Strategy for Motorized Off-Highway Vehicle Use on Public

Lands. U.S. Department of the Interior Bureau of Land Management Washington, DC. Accessible at https://www.ntc.blm.gov/krc/uploads/320/National%20OHV%20Strategy.pdf.

United States Geological Survey (USGS). 2007. Environmental Effects of Off-Highway Vehicles on Bureau of Land Management Lands: A Literature Synthesis, Annotated Bibliographies, Extensive Bibliographies, and Internet Resources. U.S. Geological Survey, Reston, Virginia. Open-File Report 2007-1353. Accessible at https://pubs.er.usgs.gov/publication/ofr20071353.

United States Department of Agriculture, Forest Service (USFS). 1998. Off-Highway Vehicle Trail and Road Grading Equipment. U.S. Department of Agriculture, Forest Service, Technology & Development Program. Document No. 9823-2837-MTDC. Available at https://www.fhwa.dot.gov/environment/recreational_trails/publications/fs_publications/98232837/index.cfm. Accessed April 2020.

United States Department of Agriculture, Forest Service (USFS). 2002. Managing Degraded Off-Highway Vehicle Trails in Wet, Unstable, and Sensitive Environments. Missoula Technology and Development Center. Report 2E22A68—NPS OHV Management

United States Geological Survey (USGS). 2006. Low-Water Crossings: Geomorphic, Biological, and Engineering Design Considerations. U.S. Department of Agriculture, Forest Service, Technology & Development Program. Document No. 0625 1808—SDTDC. Accessed at https://www.fs.fed.us/eng/pubs/pdf/LowWaterCrossings/LoWholeDoc.pdf.

United States Department of Agriculture, Forest Service (USFS). 2007. Trail Construction and Maintenance Notebook - 2007 Edition. U.S. Department of Agriculture, Forest Service, Technology & Development Program. Document No. 0723-2806-MTDC. Available at https://www.fhwa.dot.gov/environment/recreational_trails/publications/fs_publications/07232806/. Accessed April 2020.

United States Department of Agriculture, Forest Service (USFS). 2008. Effects of All-Terrain Vehicles on Forested Lands and Grasslands. U.S. Department of Agriculture, Forest Service, Technology & Development Program. Document No. 0823 1811—SDTDC. Accessible at https://www.fs.fed.us/eng/pubs/pdf/ATV/lo%20res.html.

United States Department of Agriculture, Forest Service (USFS). 2012. National Best Management Practices for Water Quality Management on National Forest System Lands: Volume 1: National Core BMP Technical Guide. U.S. Department of

Agriculture, Forest Service, National Best Management Practices (BMP) Program. FS-990a.

United States Department of Agriculture, Forest Service (USFS). 2013. Designing Sustainable Off-Highway Vehicle Trails: An Alaska Trail Manager's Perspective. Missoula Technology and Development Center. Project No. 8E82A76; Document No. 123-2804P-MTDC. Accessible at https://www.fs.fed.us/t-d/php/library_card.php?p_num=1123%202804P.

The California Department of Forestry and Fire Protection (CDFFP). 2020. California Forest Practice Rules 2020. Accessible at https://bof.fire.ca.gov/media/9478/2020-forest-practice-rules-and-act_final_ada.pdf

Walter, T.R., J. Salzer, N. Varley, C. Navarro, R. Arámbula-Mendoza, and D. Vargas-Bracamontes. 2018. Localized and distributed erosion triggered by the 2015 Hurricane Patricia investigated by repeated drone surveys and time lapse cameras at Volcán de Colima, Mexico. Geomorphology 319 (2018) 186–198.

Webb, N.P., E. Kachergis, S.W. Millerb, S.E. McCord, B.T. Bestelmeyer, J.R. Brown, A. Chappell, B.L. Edwards, J.E. Herrick, J.W. Karl, J.F. Leys, L.J. Metz, S. Smarik, J. Tatarko, J.W. Van Zee, and G. Zwicke. 2020. Indicators and benchmarks for wind erosion monitoring, assessment and management. Ecological Indicators 110 (2020) 105881.

Qin Wei, Q., G. Qiankun, C. Wenhong, Y. Zhe, Y. Qinghong, S. Zhijie, and Z. Fenli. 2018. A new RUSLE slope length factor and its application to soil erosion assessment in a Loess Plateau watershed. Soil & Tillage Research 182 (2018) 10–24.

Wimpey, J. and J.L. Marion. 2011. A spatial exploration of informal trail networks within Great Falls Park, VA. Journal of Environmental Management 92 (2011) 1012-1022.

Wu, K., G.A. Rodriguez, M. Zajc, E. Jacquemin, M. Clément, A. De Coster, and S. Lambot. 2019. A new drone-borne GPR for soil moisture mapping.

Appendix 1 – Definitions

All Terrain Vehicle (ATV): Any vehicle as defined by California Vehicle Code Section 111.

Beneficial Use: Uses of water as defined by Section 13050(f) of the Water Code and as described in the applicable Water Quality Control Plan. (FPRs, 2005, Title 14 CCR 895.1)

Best Management Practices (BMPs): Methods, measures, or practices selected by an agency to meet its non-point source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, or after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. (Ruffolo, 1999, California Research Bureau, California State Library)

Buffer: Land or physical barriers acquired or established contiguous to, or in the vicinity of, existing or proposed off-highway motor vehicle recreational activities to protect plant and wildlife habitat, soils, view sheds, or reduce noise and other effects on development in the surrounding areas for the purpose of sustaining off-highway motor vehicle recreation use.

CEQA: California Environmental Quality Act, Public Resources Code (PRC) Section 21000 et seq.; Title 14, CCR Article 20. CCR 4970.

Conservation: Activities, practices, and programs that sustain soil, plants, wildlife and their habitat, and natural and cultural resources as referenced in PRC Sections 5090.10, 5090.35, and 5090.50.

Construction: The act of building or assembling using different parts, materials, or elements in an ordered manner including, but not limited to physical barriers, trail building, roads, facilities, hardening of stream crossings, fencing, sediment control structures, and facilities landscaping.

Cultural Resources: Resources associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; are associated with the lives of persons important in our past; embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or has yielded, or may be likely to yield, information important in prehistory or history. Cultural resources also include Historical Resources. A resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Resources. PRC Section 5024.1, Title 14 CCR, Section 4852.

Erosion: The wearing away of rock or soil by the detachment of soil or rock fragments by water, wind, ice, and other mechanical and chemical forces. (CDPR 2008)

Erosion Controls: Drainage facilities, soil stabilization treatments, road and landing (parking) area abandonment, removal and treatment of watercourse crossings, and any other features or actions to reduce surface erosion, gullying, channel erosion and mass erosion. (FPRs, 2005, CCR 895.1 Definitions)

Facility: An OHV trail, track, road, corridor, SVRA, open-ride area, staging area, parking area (excluding structures). (CDPR 2008)

Grant: An award of funding to a local agency, educational institution or nonprofit organization.

Ground Disturbing Activity: any earth moving Project-related activity. The act of installing and/or replacing a sign, placing of boulders or other materials (other than fencing) to delineate a Facility, maintenance or replacement of existing fence lines that do not require disturbance beyond replacement of fence posts and wire or existing component, or sweeping sand/dirt from a paved road are not considered a “Ground Disturbing Activity”. (14 CCR 4970.01)

Gully: An erosion channel cut into the soil along a line of water flow with a minimum depth of 6 inches and cross-sectional area of one square foot. (Schwab et al, 1993, Soil and Water Engineering USDA, 1993, Soil Survey Manual; USDA, 1993, Soil Survey Manual; and CDF Hillslope Monitoring Study)

Gully Erosion: Erosion of soil or soft rock materials by running water that forms distinct channels generally greater than 6 inches deep and that usually carry water only during and immediately after heavy rains or following the melting of ice or snow. (Modified from American Geological Institute, Glossary of Geology and CDF Hillslope Monitoring Study)

Long-Term: At a minimum, 25 years (CCR 4970, 2005).

Maintenance: The work required to ensure effective and efficient use of physical facilities, OHV recreational opportunities, and the protection of natural and cultural resources.

Management: The coordinated implementation of budgeting, staffing, scheduling, design, construction, maintenance, monitoring and restoration activities at an OHV facility, as needed, combined with the effective utilization and coordination of resources, such as capital, labor, materials, and natural landscape, to achieve the soil conservation standard, and to ensure effective and efficient use of OHV recreational opportunities while protecting natural and cultural resources. (CDPR 2008).

Management Unit: Area of land with distinct boundaries that often includes lands with similar resources and management objectives. Management units define manageable-sized areas for organizing and scheduling maintenance work. (DPR DOM 0313.1.1.1.2)

Marsh: Flat, wet, treeless areas usually covered by standing water and supporting grasses and grass-like plants. (1991 Soil Guidelines)

Monitoring: Data collection used by a land management agency and/or the Division to make appropriate decisions.

NEPA: National Environmental Policy Act pursuant to United States Code (U.S.C.) Title

42, Section 4371; 40 Code of Federal Regulations (CFR) part 1500.1 et seq. CCR 4970, 2008, OHV Grants and Cooperative Agreements Program Regulations

Off-Highway Vehicle: An off-highway motor vehicle as specified in CVC Section 38006 and street licensed motor vehicles while being used off-highway. (CCR 4970, 2005)

Off-Site: Beyond the borders of the designated off-highway vehicle area. Off-site need not mean transport onto land under a different ownership. (1991 Soil Guidelines)

Open Area or Open Ride Area: An expansive area used by off-highway vehicles, where vehicle use is not limited to designated roads or trails. Established routes of travel often exist or become established in Open Ride areas, but almost any portion of the site may become impacted by off-highway vehicles at any time. (1991 Soil Guidelines)

Prescribed Use: The type of OHV activity at the facility as established by the managing entity. (CDPR 2008)

Project: means the activities and deliverables described in the project application to be accomplished with funding through, which includes both Grant funds and matching funds a project agreement. (14 CCR 4970.01)

Project Area: the physical boundaries within which the activities will be performed, and deliverables will be accomplished as described in the project agreement. (14 CCR 4970.01)

Public Lands: Federal, state, county or city-owned or administered lands. (1991 Soil Guidelines)

Recondition: To return a site to a functional condition. (Modified from Webster’s 10th Edition Dictionary)

Repair: To fix, mend, make new, or revitalize to sound condition after being damaged.

Restoration: Upon closure of an OHV unit or any portion thereof, the restoration of land to the contours, the plant communities, and plant covers comparable to those on surrounding lands, or at least those that existed prior to off-highway motor vehicle use. (PRC Section 5090.11)

Rill: An erosion channel cut into the soil along a line of water flow greater than 1 inch and less than 6 inches deep. (CDF Hillslope Monitoring Program)

Rill Erosion: The development of numerous closely spaced channels generally less than 6 inches deep that result from the uneven removal of surface soil by running water that is concentrated in streamlets of sufficient volume to generate cutting power. (Modified from Glossary of Geology and CDF Hillslope Monitoring Study)

Riparian Area: The banks and other adjacent terrestrial environs of lakes, watercourses, estuaries, and wet areas, where transported surface and subsurface freshwaters provide soil moisture to support mesic vegetation. (FPRs, 2005, 895.1)

Roads: Logging roads, service roads, and other roughly graded roads upon which vehicular travel is permitted. (CVC 38000)

Route: A road, trail, course, or way for travel from one place to another. (The American Heritage Dictionary of the English Language, fourth Edition)

Recreational Off-Highway Vehicle (ROV): Any vehicle as defined by California Vehicle. (Code Section 500)

Sedimentation: The process by which soils, debris and other materials are deposited, either on land or in water. (CDPR 2008)

Significant: Having a substantial or potentially substantial effect. (CDPR 2008)

Snowmobile: is a motor vehicle designed to travel over ice or snow in whole or in part on skis, belts, or cleats, which is commonly referred to as an Over Snow Vehicle (OSV) as defined in CVC 557.

Soil: All unconsolidated materials above bedrock; the unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants; the unconsolidated mineral or organic matter on the surface of the earth that has been subjected to and shows effects of genetic and environmental factors of climate (including water and temperature effects), and macro-and microorganisms, conditioned by relief, acting upon parent material over time. Soil differs from the material from which it is derived in many physical, chemical, biological and morphological properties and characteristics. (American Geological Institute, Glossary of Geology, 1997)

Soil Erosion: Detachment and movement of topsoil, or soil material from the upper part of the profile, by the action of wind or running water, or as a result of changes brought about by human activity. It includes: rill erosion, gully erosion, sheet erosion and wind erosion. (American Geological Institute, Glossary of Geology, 1997)

Soil Loss: Movement of soil material to a location where the soil cannot be reasonably retrieved and/or recycled. (CDPR 2008)

Staging/Parking/Camping Areas: These areas include all sites (designated and undesignated) that are used for these activities. Staging areas commonly include areas to unload off-highway vehicles from trucks or trailers and areas to fuel, maintain, and wash the vehicles during and after use. This includes areas in the vicinity of restrooms and bulletin boards. (1991 Soil Guidelines)

Standard: Any definite rule, principle, or measure established by authority. Something established by authority, custom, or general consent as a model or example (criterion); something set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. (Webster's 9th New Collegiate Dictionary)

Stream: A natural watercourse as designated by a solid line or dash and three dots symbol shown on the largest scale United States Geological Survey map most recently published. (FPRs, 2005, PRC section 4528 (f))

Sustainability: Managing soil and crop cultural practices so as not to degrade or impair environmental quality on or off-site, and without eventually reducing yield potential

as a result of the chosen practice through exhaustion of either on-site resources or nonrenewable inputs. (American Geological Institute, Glossary of Geology, 1997)

Sustainable: The facility is managed to meet the soil conservation standard for a minimum service life of 25 years as defined by CCR 4970. (CDPR 2008)

Track: A facility designed and constructed for confined use of races and practice riding. (1991 Soil Guidelines)

Trail: Any route that is not designated as a road. (1991 Soil Guidelines)

Trail Rehabilitation: temporarily closing a trail to improve drainage features and to improve long-term sustainability.

Volunteer Trail: A trail that was formed by the passage of vehicles and not built by earth moving machines or hand tools. (California State Parks)

Watercourse: Any well-defined channel with distinguishable bed and bank showing evidence of having contained flowing water indicated by deposit of rock, sand, gravel, or soil, including but not limited to, streams as defined in PRC 4528 (f). FPRs, 2005, Title 14 CCR 895.1 Definitions

Appendix 2 – Trail Evaluation Form

I. Form Header Information

Trail Name / No.
Enter name and/or number of the trail for the rated segment.

Vehicle Type
Circle one or more of the vehicle types, MC (motorcycle), ATV (all-terrain vehicle), or 4x4 (four wheel drive), or SM (snow mobile).

Trail Difficulty
Circle one of the trail difficulties, easiest, more difficult, most difficult.

USGS Quad
Enter the name of the USGS topographic map quadrangle on which the rated segment occurs.

Planning Watershed
Enter in either the name or the code for the CalWater (2.2) planning watershed in which the trail occurs (http://www.ca.nrcs.usda.gov/features/calwater/).

Begin Segment
Enter the location where the rated segment starts. This could be a GPS file designation, a named trail junction, a milepost, etc.

End Segment
Enter the location where the rated segment ends. This could be a GPS file designation, a named trail junction, a milepost, etc.

Site Characteristics
Give a generic description of the site and soil-related conditions that exist along the trail.

Soil/Geology
Enter a brief description of the soil and/or geologic units on which the trail segment is located. Information can be provided from field observations by a qualified soil scientist or geologist, or it may be obtained from NRCS or USFS soils maps, geological publications listed in the California Geological Survey (CGS) geology/soils index and website, and other published and unpublished reports including

Vegetation
Enter a brief description of the primary vegetation present in the vicinity of the trail.

Range of Side Slopes
Circle the range of side slope percent (%) that the segment of trail crosses.

Trail Slope
Enter the average trail slope and the maximum trail slope in percent (%) for the segment evaluated.

Rating (GYR)
As the final step in completing the form, enter the recommended overall rating for the whole segment. Enter only one letter for the rating: a G, Y, or R.

GPS Ref
Enter the file name of the GPS record. Add location information following post-processing of the GPS record.

Rated By
Enter your name or initials as the rater.

Date
Enter the date the field observations were made and recorded.

Reviewed By
Signature of responsible official who reviewed and acted on the rating.

Date
Date reviewed by responsible official.

Page __ of __
Enter page number and total number of pages used to rate the segment.

II. Form Body Information

Column 1 – Section; Begin – End
For features with a length dimension, enter the beginning and ending distance of that feature, e.g. 1200 feet to 1500 feet for a 300foot feature. Distance can either be from an established reference point such as a trail marker (mile post) or intersection, or the GPS file designation for the beginning and ending points.

Column 2 - Section Length
Enter the length of the section being evaluated and note whether it is an estimate or has been measured.

Column 3 - Trail Slope
Enter the slope (grade) of the tread surface for the section evaluated as a percent (%) If the slope varies, enter the range followed by the slope most typical for the section in parentheses, e.g. 3 – 25% (6%).

Column 4 - Crossings
Facing downstream, every crossing has three primary components: the left approach (LA), the right approach (RA) and the channel section (CS). Enter a checkmark (√ or X) in the column corresponding to the part of the crossing being evaluated, e.g. LA for left approach. Rate each component on a separate line. Rate each approach according to G7, Y7, or R7. Rate each channel section according to G8, Y8, or R8. Record the condition of all watercourse approaches even if the rating is a G7. This serves as documentation that the approach was evaluated.

	Approach Length (from last water break or drainage divide to channel)		
Trail Gradient	< 30 feet	30 – 150 feet	> 150 feet
< 8 %	G7	G7	Y7
8 – 20%	G7 or Y7	Y7 or R7	R7
> 20%	Y7 or R7	R7	R7

Guidelines for Rating Approaches to Watercourse Crossings

The key concept is sediment delivery. Where runoff water from a trail is drained onto a natural slope a long distance from a watercourse, most sediment is filtered out before it can reach a watercourse.

Column 5 - GYR Condition Codes
Enter the appropriate condition code using the Green, Yellow, Red indicators of trail conditions listed as guidelines. More detailed descriptions are presented in the expanded 2008 Soil Conservation Guidelines/Standards for OHV Recreation Management. Where variable conditions are encountered, the rater will have to use good judgment using the condition codes as an overall guide. Additional details can be written in the comments section of the form.

Column 6 - Cause Codes
Using the cause codes provided as guidelines, enter a cause code for each trail section where a condition code was entered in Column 5. More detailed cause code descriptions are presented in the expanded 2008 Guidelines/Standards. Most trail condition problems have multiple causes. Generally, one to three causes, listed in order of importance, will be enough to describe the problem. If the cause of an observed condition is unique, then describe that cause in the comments column. A cause code combined with a GYR condition code will usually both describe the problem and identify a treatment.

Column 7 – Comments
Record observations and recommendations not captured by the basic codes, including unique non-repeatable data.

Column 8 – Photograph Number (s)
Enter the identification number(s) for photographs taken of the evaluated section. As a minimum, one photo should be taken for each section given a Red condition code. If the entire trail segment has been rated Green, take at least one photograph of a representative section of the trail segment

OHV Trail Condition Evaluation Form

Trail Name ____________________________Trail No. _____________ Vehicle Type: MC ATV 4x4 SM Trail Difficulty: easiest, more difficult, most difficult

USGS Quad _________________ Planning Watershed ______________________ Begin Segment ______________ End Segment ________________

Site Characteristics: Soil/Geology ___________________________________ Vegetation ________________________ Side Slopes: 0-30% 30-50% >50%

RATING (**G**,**Y**,**R**) ____GPS Ref ______________ Avg Trail Slope ___% Max Trail Slope ___% Rated By ____ Date ____ Reviewed By ___ Date ___ Page __ of __

Section B = Begin E = End	Section Length	Trail slope	Crossings			Cause Codes	Comments	Photograph Numbers
			LA	CS	RA			
B E								
B E								
B E								
B E								
B E								
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B E								
B E								
B E								
B E								

OHV Trail Condition Evaluation Code Key

	Green		Yellow		Red
G1	**Water control** is provided by enough functional water breaks to divert runoff from the trail before it has the volume and velocity to cause erosion. Where present, rills occur on less than 1/3 of the distance between water breaks.	Y1	Water breaks do not divert all runoff from the trail because they are nearly filled to capacity and/or are partially breached, or spaced too widely. Where present, rills occur on more than 1/3 of the distance between water breaks	R1	Water breaks no longer divert runoff from the trail because they are full and/or have been breached, or are absent or spaced too widely. Gully or rill erosion may be present.
G2	No accelerated **erosion off-trail.** Runoff at water break outlets and on slopes adjacent to the trail is dispersed effectively. Vegetation or litter filters all sediment.	Y2	Rill erosion and/or sediment deposition occurs at water break outlets and/or on slopes adjacent to the trail. All sediment is filtered or deposited before it reaches a watercourse.	R2	Gully erosion occurs at water break outlets or on slopes adjacent to the trail and/or sediment is transported to a Type I or Type II watercourse.
G3	**Sediment traps**, where present, are functional and have adequate capacity for at least one season of use. Trapped sediment can be retrieved during normal maintenance.	Y3	Where present, most sediment traps are full or nearly full, but still functional. Most trapped sediment can be retrieved during normal maintenance.	R3	Where present, sediment traps have been breached and have a plume of sediment and/or a gully below the breach. Most sediment cannot be retrieved.
G4	**Tread wear** is minimal. Tread is generally incised less than 6 inches. Tread wear is generally evident on less than 1/3 of the distance between water breaks or on less than 1/3 of the tread width.	Y4	Tread wear is evident. Tread is generally incised 6 to 12 inches and tread wear is generally evident on more than 1/3 the distance between water breaks and on more than 1/3 of the tread width.	R4	Tread wear is severe. Tread incision is generally greater than 12 inches deep and tread wear is generally evident on the entire distance between water breaks.
G5	**Tread width** is generally no greater than 1.5 times the design width for the designated use.	Y5	Tread width is generally greater than 2 times the design width for the designated use and appears to be increasing.	R5	Tread width is generally greater than 3 times the design width for the designated use and has caused or is causing erosion, sedimentation, and damage to vegetation.
G6	**Off-trail travel is** limited to single tracks or single passes generally less than 300 feet long. Tracks are not eroded and have little effect on water control.	Y6	Off-trail travel is common, well defined, and generally greater than 300 feet long. Water control is inadequate and some erosion is apparent.	R6	Off-trail travel has caused severe resource damage, gully erosion, eroded hill climbs, or extensive damage to vegetation and/or sensitive habitat.
G7	**Approach to watercourse crossing** is short and has a gentle gradient. Tread is stable, shows little evidence of erosion, and is at design width. No damage to riparian vegetation outside the tread.	Y7	Approach to watercourse crossing is short and steep or long and gentle. Tread may show some evidence of erosion and may show evidence of widening. Minimal damage to riparian vegetation.	R7	Approach to watercourse crossing is both steep and long and/or tread is unstable and shows evidence of accelerated erosion. Approach may be widening and damaging riparian vegetation.
G8	**Channel Section** has only minor channel widening, minor bank erosion, no bars.	Y8	Channel Section has widened moderately, modest bank erosion, modest lateral and/or mid-channel bars.	R8	Channel Section has widened significantly, extensive bank erosion, large lateral and mid-channel bars.
G9	**Outboard Fill** is stable. Exhibits minor surficial sloughing without sediment transport	Y9	Outboard Fill is distressed. Exhibits cracking and Moderate sloughing w/ limited sediment transport.	R9	Outboard Fill has failed and sediment is moving down slope.

	CAUSE CODES		CAUSE CODES
C1	Water breaks not constructed to design standards	**C11**	Rocks or roots exposed in tread
C2	Water break spacing is too wide for conditions	**C12**	Barriers (natural or constructed) to control traffic are lacking
C3	Cascading runoff from a trail or road upslope	**C13**	Mechanical erosion makes maintenance ineffective
C4	Cascading runoff from an impervious surface upslope	**C14**	Storm intensity unusual or unique for the area
C5	Wet area caused by a seep or spring	**C15**	Design / layout /construction prevents effective drainage
C6	Excess soil moisture at time of use	**C16**	Uncompacted sidecast on outboard slope
C7	Trail section is poorly located (describe)	**C17**	Berms, Whoops, and stutter bumps
C8	Trail gradient is too steep for the type and/or amount of use occurring	**C18**	Crossing alters channel dimensions and/or stream gradient.
C9	Segment is not ~~designated or~~ designed for the type or amount of use occurring	**C19**	Rutting or vegetation damage to meadow, spring, wet area, riparian area
C10	Trail Blockage, e.g. brush, logs, rockfall, landslide	**C20**	Segment is not designed for the type and amount of use occurring

Appendix 3 – Maintenance Checklist Form

Mechanized Construction - Maintenance Checklist

Trail Name _____________Trail No.__________ Segment No. _____________

Trail Difficulty easiest more difficult most difficult Max Trail Slope ___% Ave Trail Slope ___%

Activity: maintenance reconditioning new construction Side Slope:___%
Drainage: Outslope Rolling Dip Confined Flat Other______
Equipment: Hand Trail Tractor Mini-excavator Other_________
Soil Type: clayey loamy sandy Rock Fragments (%): <15 15-50 >50
Soil Depth: shallow deep Vegetation Type: _______ Photo Numbers: ___________
Operator _________________ Assistant(s) ____________Date _______
Last Maintenance (mo/yr) _____ Maintenance Type : Hand Mechanical
Notes:____

Guideline	Yes	No	N/A
1. This checklist was reviewed before starting maintenance or construction on this trail			
2. Prior to mobilization the completed OHV Trail Condition Evaluation Forms were reviewed and trail segments, sections, or features needing maintenance or reconditioning were confirmed.			
3. Equipment was operated by certified operators, or under direct supervision of certified operator			
4. If new, this trail was constructed to Guidelines			
5. OHV rolling dips were constructed/maintained by compacting moist soil in lifts no greater than 4 inches loose thickness			
6. Prior to mobilization, need for maintenance with mechanical equipment was validated			
7. The blade was lifted and the equipment walked across sections of trail that needed no maintenance			
8. Soil collected in rolling dip outlets was recycled into rolling dip structures or back onto the trail tread			
9. Berms were worked back into the trail tread, not bladed off the trail as sidecast			

10. Rills and gullies in treads were repaired with soil reclaimed from rolling dip outlets or from outside berms, not by blading the trail tread			
11. Soil sloughed from cutbanks or sideslopes above the trail was bladed only as needed to maintain a safe trail; cutbanks were not bladed into or undercut			
12. Whoops and stutter (braking) bumps were repaired by ripping, blading, and compacting trail treads when soil was moist (except for non-cohesive soils)			
13. The amount of soil moved was the smallest amount needed to meet the maintenance objective			
14. Where soil was too dry for compaction, maintenance was deferred or done by hand			

If "no" is checked, enter a footnote number and write a brief explanation under comments.
Comments: ____
____
____