## Project Summary

Eolian deposits are recognized as areas of higher biological value because they support specific natural communities and wildlife habitats. In response to potential increased land use from renewable energy projects in California where eolian deposits and processes are present, the California Department of Fish and Wildlife (CDFW) and the State and Federal Renewable Energy Action Team have designated sand dunes and their associated processes as areas of higher biological value for inclusion into a Habitat Conservation Plan / Natural Community Conservation Plan. This plan is known as the Desert Renewable Energy Conservation Plan (DRECP, [http://www.drecp.org/)](http://www.drecp.org/%29). The Department of Conservation's California Geological Survey (CGS) provided CDFW with technical assistance on Eolian System Mapping under the Cooperative Endangered Species Conservation Fund (Section 6) Grant Program (Agreement Number P1382002). This project addresses the need for map-based information that identifies the presence of active eolian deposits and their source areas. The Imperial Dunes area is one of several priority areas that are part of the DRECP, identified as Development Focus Areas.

## Mapping Methods

These maps were developed by CGS to assist in identifying components of the eolian system, including active areas of deposition, source areas, and zones of sand transport. The maps are based on compilation of existing sources and new mapping by CGS of Quaternary age surficial deposits that form the interpretive source in the identification of eolian deposits, sources, and zones of transport for each study area. Depending on the geomorphic setting, eolian processes range from primary to secondary (Blair and McPherson, 1994). Within the regional zone of transport, eolian sand accumulates as dunes, sand sheets, and sand ramps. Eolian processes are primary where thick deposits accumulate, develop dune forms, and influence the geomorphology of the landscape. Where these eolian sand accumulations attain sufficient thickness (> 1.5 m) they are typically portrayed as eolian deposits on geologic maps. However, complex interactions occur locally on the landscape between source, and deposition areas. Eolian sand is transported across playa lakes, playa fringe, alluvial fans, alluvial washes, and along bedrock divides. In these geomorphic settings, the primary processes acting on the landscape are gravity-driven flow of water and gravity-induced slope movements (e.g. translational failures and rockfalls). Along playa margins and piedmont landforms, transported eolian sediment interacts with vegetation and topographic irregularities that act as baffles, causing eolian sediment to deposit as thin sand sheets superimposed on these geomorphic surfaces. In the presence of vegetation, sand sheets are typically thin, relatively planar, and lack dune form (Cooke et al., 1993).

To address this complexity, CGS used a hybridized mapping nomenclature that identifies both the primary geomorphic process and the secondary processes superimposed on those features that are specific to eolian systems. Using an original surficial geologic nomenclature of Bedrossian et al. (2012), CGS developed a hybrid geologic nomenclature to identify the presence of eolian veneers. For example, a Holocene to late Pleistocene age alluvial fan (Qyf) within an active eolian transport corridor, may be overlain by a veneer eolian sand. In order to represent the superimposition of this secondary process on the landscape, the map unit is termed Qe/Qal. Conversely, the designation Qe is used singularly when the map unit attained an estimated thickness of > 1.5 m.

## Reference:

Lancaster, J. T., Bedrossian, T. L., and Holland, P., 2014, Eolian System Mapping for the Desert Renewable Energy Conservation Plan, California Geological Survey, 54p., 4 plates (multiple map scales).

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## Use limitations

These maps (Plates 1-4), are regional in nature and should not be used as a substitute for detailed studies in any specific area. In accordance with the project scope of work, the interpretive classification was conducted at scale of 1:24,000, with a minimum size mapping unit of 40 acres. These maps are intended for regional planning efforts and may be used as the framework to identify regional eolian processes and to guide future studies. For additional discussion regarding each mapped area, please refer to the project report (Lancaster et al., 2014).

## Feature Class Attributes:

Source\_name: Describes whether the associated polygon is an eolian deposit or a source of eolian deposits, or other map units.

Source\_ptype: Describes the depositional setting (see abbreviated descriptions below).

Activity: The geomorphic activity state of the depositional setting.

Activity\_type: The type of activity, e.g., for eolian deposition this would include “dunes and sand sheets.”

## Feature Class Descriptions

### Feature Class Name: JohnsonValley\_Plate1

**Abbreviated description of map units:**

**Active Eolian Deposits**

**Qe/Qal** Active windblown deposits consisting primarily of sand sheets superimposed on alluvial deposits typically < 1.5 m in thickness.

**Qe** Active windblown deposits consisting of dunes and sand sheets typically greater than > 1.5 m in thickness.

**Active Eolian Sources**

**Qw** Alluvial wash deposits

**Qyf** Young alluvial fan deposits.

**Qye** Windblown deposits consisting primarily of sand sheets and eroded dunes.

**Ql** Lacustrine deposits of Holocene and Pleistocene age.

**Other Map Units**

**Qal**  Alluvial deposits of Holocene and Pleistocene age (undifferentiated).

**br**  Bedrock (undifferentiated).

**D** Areas within active sand transport/deposition resulting from anthropogenic modification of the land surface.

**JohnsonValley\_Plate1 Extent**

|  |  |  |  |
| --- | --- | --- | --- |
| West  | -116.751446 |  East  | -116.499681 |
| North  | 34.500761 |  South  | 34.301856 |

### Feature Class Name: East\_Riv\_Plate2

**Abbreviated description of map units:**

**Active Eolian Deposits**

**Qe/Qal** Active windblown deposits consisting primarily of sand sheets and coppice dunes superimposed on alluvial deposits typically < 1.5 m in thickness.

**Qe** Active windblown deposits consisting of dunes and sand sheets typically greater than > 1.5 m in thickness.

**Active Eolian Sources**

**Qw** Alluvial wash deposits

**Qf** Alluvial fan deposits of latest Holocene age.

**Qyf** Alluvial fan deposits of latest Holocene age.

**Qa/Ql** Alluvial valley and lacustrine deposits of late Holocene age.

**Potential Eolian Sources**

**Qye/Qal** Stabilized windblown deposits consisting primarily of sand sheets and a small percentage of stabilized dunes superimposed on alluvial deposits.

**Qol** Lacustrine deposits of late Pleistocene age.

**Other Map Units**

**Qoa**  Alluvial deposits of Pleistocene age (undifferentiated).

**br**  Bedrock (undifferentiated).

**D** Areas within active sand transport/deposition resulting from anthropogenic modification of the land surface.

**East\_Riv\_Plate2 Extent**

|  |  |  |  |
| --- | --- | --- | --- |
| West  | -115.468760 |  East  | -114.665968 |
| North  | 33.971524 |  South  | 33.498832 |

### Feature Class Name: San\_Felipe\_Plate3

**Abbreviated description of map units:**

**Active Eolian Deposits**

**Qe2/Qal** Active windblown deposits consisting primarily of sand sheets superimposed on alluvial or Lake Cahuilla deposit typically < 1.5 m in thickness.

**Potentially Active Eolian Deposits**

**Qe1/Qal** Stabilized eolian deposits consisting of sand sheets and coppice dunes overlying alluvial and Lake Cahuilla deposits.

**Active Eolian Sources**

**Qw** Alluvial wash deposits

**Qf** Alluvial fan deposits of latest Pleistocene and Holocene age (undifferentiated).

**Ql**  Lacustrine deposits of former Lake Cahuilla.

**Qa**  Alluvial valley deposits of late Pleistocene and Holocene age.

**Other Map Units**

**Qoa** Alluvial deposits of Pleistocene age.

**D**  Areas with inactive sand transport/deposition resulting from anthropogenic modification of the land surface.

**br**  Bedrock (undifferentiated).

**San\_Felipe\_Plate3 Extent**

|  |  |  |  |
| --- | --- | --- | --- |
| West  | -116.127075 |  East  | -115.874247 |
| North  | 33.127051 |  South  | 32.998050 |

### Feature Class Name: Imperial\_Plate4

**Abbreviated description of map units:**

**Active Eolian Deposits**

**Qe3/Qal** Active windblown deposits consisting primarily of sand sheets and coppice dunes superimposed on alluvial deposits typically < 1.5 m in thickness.

**Qe3** Active windblown deposits consisting of dunes and sand sheets typically greater than > 1.5 m in thickness.

**Qe2/Qal** Active and partially stabilized windblown deposits consisting of sand sheets and coppice dunes superimposed on alluvial deposits, typically < 1.5 m in thickness.

**Qe2**  Active and partially stabilized windblown deposits consisting of dunes and sand sheets typically > 1.5 m in thickness.

**Active Eolian Sources**

**Ql** Lacustrine deposits of former Lake Cahuilla.

**Qw** Alluvial wash deposits

**Qf** Alluvial fan deposits of latest Holocene age.

**Qyf**  Alluvial fan deposits of latest Pleistocene and Holocene age.

**Qe1/Qal** Stabilized windblown deposits consisting of sand sheets superimposed on lacustrine and alluvial deposits of Pleistocene age.

**Potential Eolian Sources**

**Qol**  Lacustrine deposits of Pleistocene age.

**Other Map Units**

**Qoa**  Alluvial deposits of Pleistocene age (undifferentiated).

**D**  Areas with in active sand transport/deposition resulting from anthropogenic modification of the land surface.

**af**  Artificial fill

**br** Bedrock (undifferentiated).

**Imperial\_Plate4 Extent**

|  |  |  |  |
| --- | --- | --- | --- |
| West  | -115.510669 |  East  | -114.737446 |
| North  | 33.253299 |  South  | 32.653586 |