

Oceano Dunes Science Advisory Group (SAG) Technical Discussion

*State Parks Draft Particulate Matter Reduction Plan
Public Workshop, 1 May 2019
South County Regional Center, Arroyo Grande, CA*

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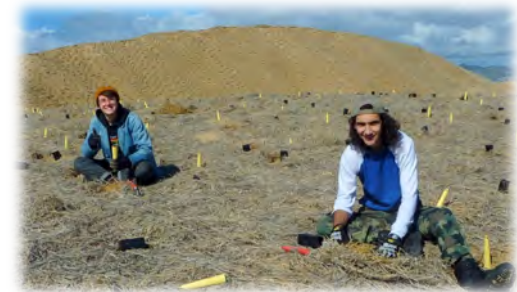
Composition, Function & Goals of SAG

- Team of experts on dust emissions, air quality, wind erosion, dune geomorphology, and plant ecology mandated by the 2018 SOA and agreed upon by CalParks OHMVR Division and SLO Air Pollution Control District
- Function & Goals:
 - independent administrative and advisory panel of experts assembled to evaluate, assess, and provide recommendations on the mitigation of windblown PM₁₀ emissions from ODSVRA and on the development of the PMRP and related annual Reports and Work Plans
 - 1. provide scientific analysis and recommendations to OHMVR for development of the PMRP
 - 2. critical analyses of the PRMP and related annual Reports/Work Plans for use by the APCO
 - 3. assess progress, timelines, and amendments to the PMRP, and related Reports based on new learnings [adaptive management]
 - 4. review scientific and technical issues related to the research, development, and implementation of PM₁₀ controls and prepare technical specifications and analyses of proposed mitigation measures
 - 5. a vehicle for increased cooperation and collaboration between OHMVR, APCO, and affected stakeholders
 - 6. foster communication and understanding of scientific and technical aspects of PM₁₀ emission control approaches



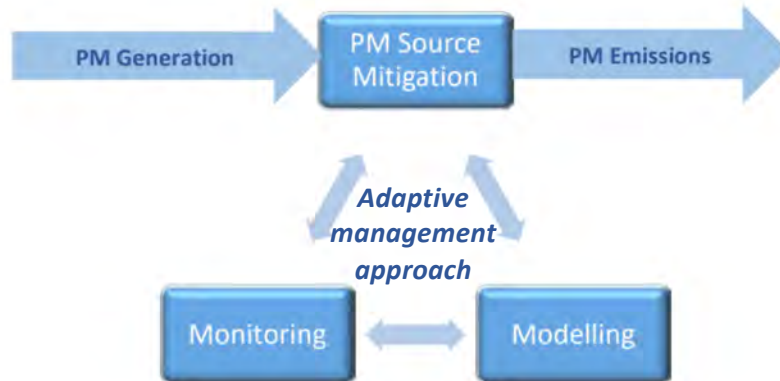
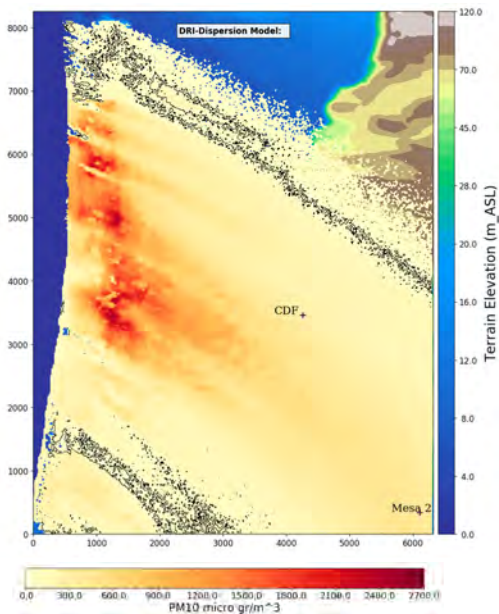
Current Status & Recommendations

- SAG met July, Oct 2018, Feb 2019 to advise on and review DPMRP
- SAG DPMRP Evaluation Report delivered 25 Feb 2019 to SLO-APCO (G. Willey)
- DPMRP revised with SAG feedback by OHMVR on 28 March 2019
- Key SAG recommendations:
 1. SAG, SLO-APCD and CARB endorse the DRI dust dispersion model
 2. baseline data collection and monitoring campaigns required to inform dust emission modelling and mitigation strategies
 - *winds, surface emissivity, sand transport, dune dynamics, dust concentrations*
 3. continued backdune vegetation planting and new foredune restoration at targeted high emission sites
 - *couple with monitoring to assess effectiveness*
 4. detailed timelines and responsibilities for OHMVR mitigation projects
 - *see 28 March, sect. 6.3 revised DPRMP*
 5. improve resourcing/personnel for project coordination and implementation



Dust Mitigation Plan

SOA Obj. 2.c requires establishing an initial target of reducing maximum 24-hour PM_{10} baseline emissions by 50% using air quality modeling and a May-Aug 2013 observation period carried out by the California Air Resources Board (CARB), or other modeling groups, subject to the review of the Scientific Advisory Group (SAG).

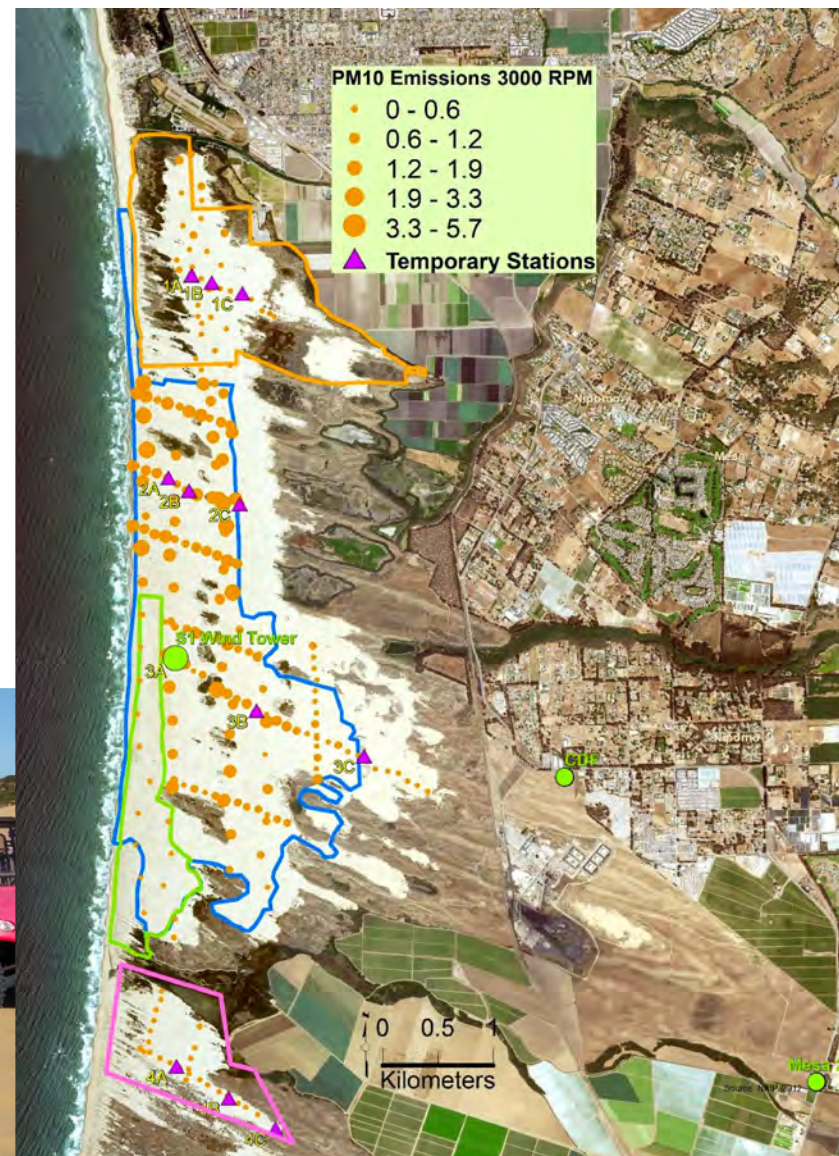
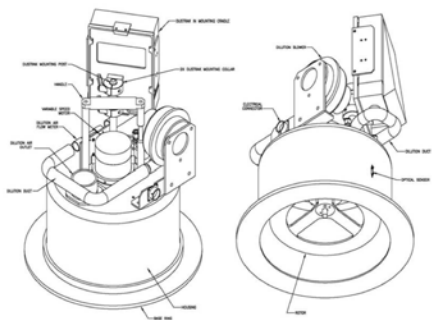


| Dust Generation | Mitigation | Monitoring | Modelling |
|-----------------|--------------------------------|-------------------------|----------------------|
| Natural | Foredune creation | Meteorology | Dispersion modelling |
| Anthropogenic | Vegetation cover | PM concentration | Calibration |
| | Trapping: fencing, straw bales | PI-SWERL: PM emissivity | Sensitivity analyses |
| | Exclusion: temporal & spatial | Sand flux | |
| | | Topography | |



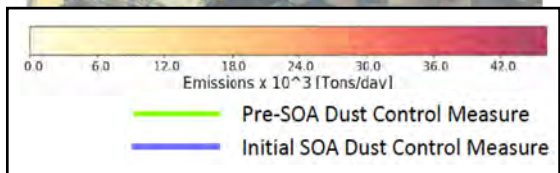
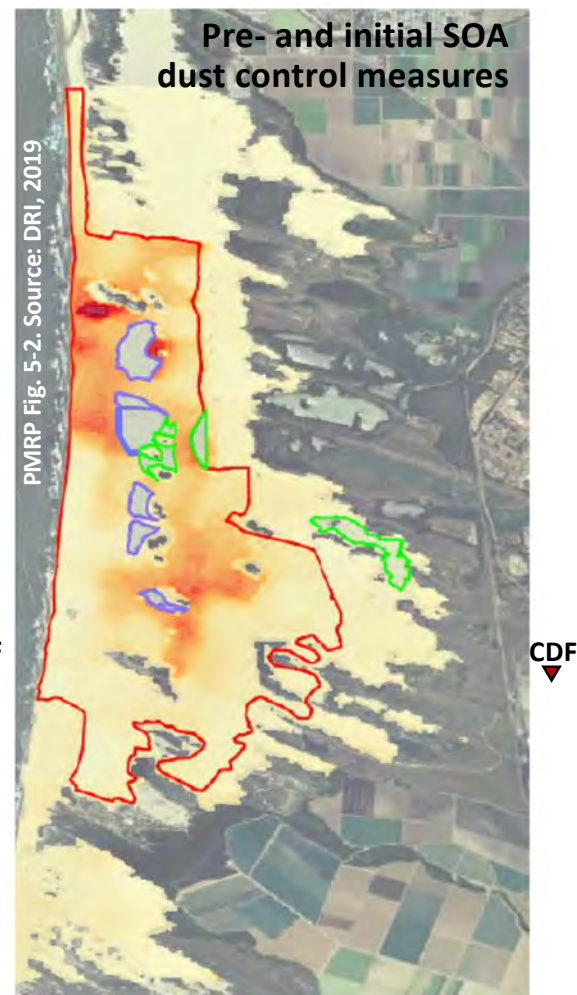
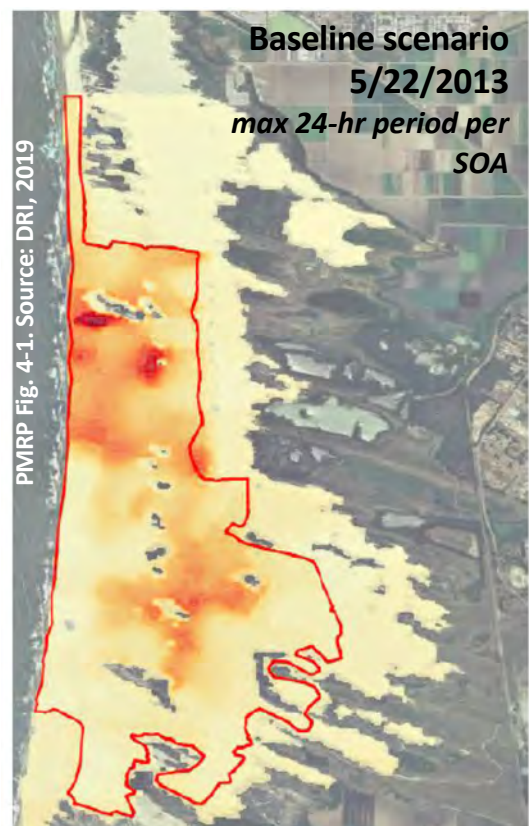
Dust Emissivity Assessment

- Portable In-Situ Wind Erosion Lab (PI-SWERL)
 - controlled systematic emissivity testing
 - PM_{10} emissions ($mg\ m^{-2}$) for a range of windspeeds
 - 360 measurement locations in Aug-Sept 2013
 - repeat measurements by DRI in summer 2019



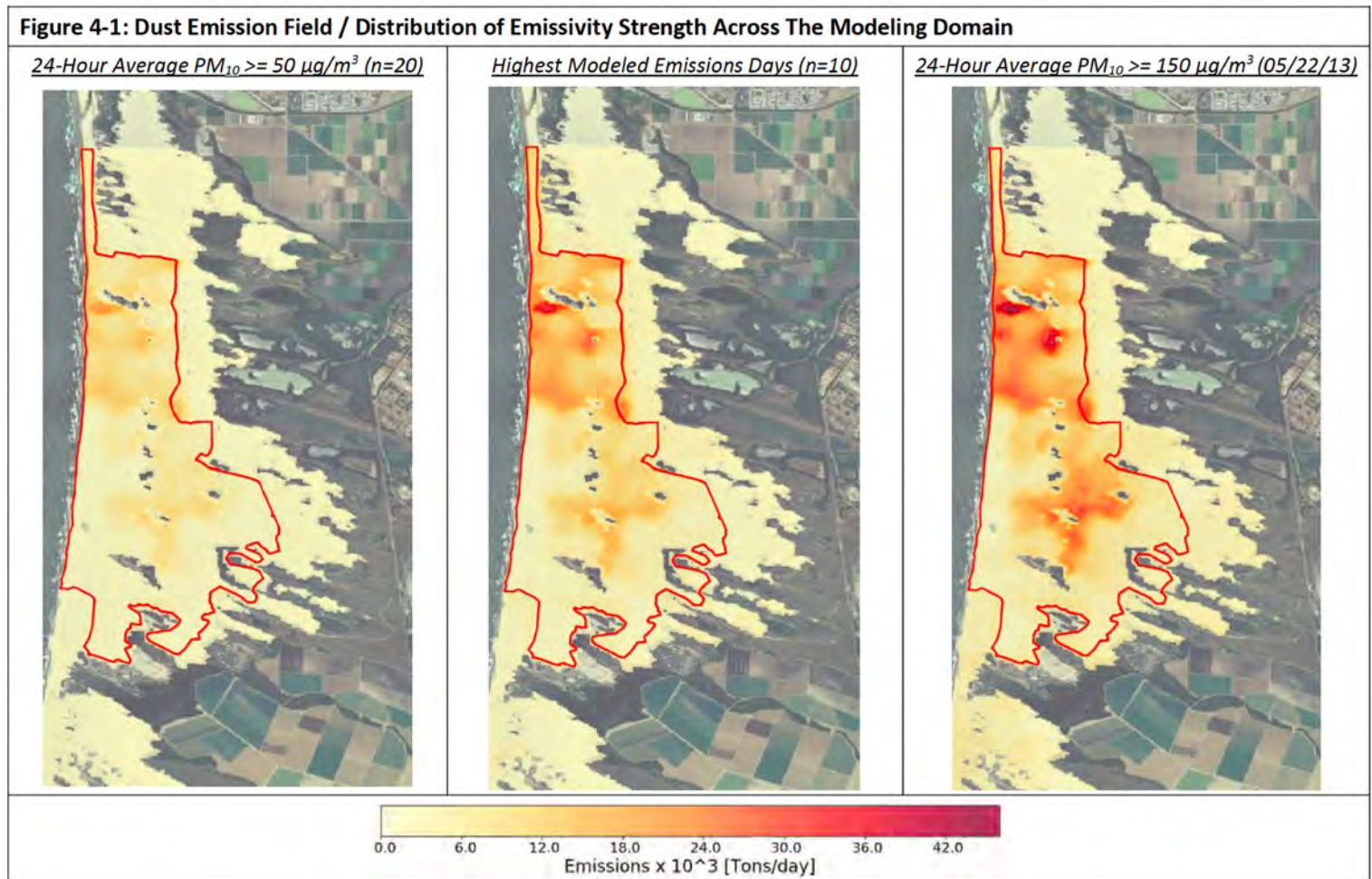
Oceano Dunes Dust Emissions Modelling

- DRI Lagrangian Dust Dispersion model (Mejia et al. in review)
 - Endorsed by SAG, SLO-APCD, and CARB
 - Uses: PI-SWERL PM₁₀ data + CALMET + weather stations + PM₁₀ monitoring stations
 - 20 m x hourly resolution
 - A 'source-receptor' model that traces PM₁₀ received at stations to their geographic source
- Key model features and SAG assessment
 - Based on 5/22/13 wind scenario (max 24-hr period, per SOA)
 - SAG: assess other emission scenario thresholds & periods
 - Baseline dust emissivity map based on PI-SWERL measurements
 - SAG: should re-collect (summer 2019)
 - Modified control measures map assumes zero emissivity in control areas
 - SAG: monitoring required to assess effectiveness & emissivity
 - Model tracks emitted dust to CDF PM₁₀ station
 - SAG: need further measurements within the dunes to confirm



Oceano Dunes Dust Emissions Modelling

- 75-81% of emissions from 10 highest emission days in 2013 came from ODSVRA open riding area (DRI 2019)
 - 76-152 tonnes/day
- simulate effects of removing highly emissive surfaces
 - target vegetation and restoration sites



Source: DRI, 2019. Figure Notes: The red outline represents the boundary of the Oceano Dunes SVRA open riding area.

Dust Emission Reduction Modelling Scenarios

Good model performance

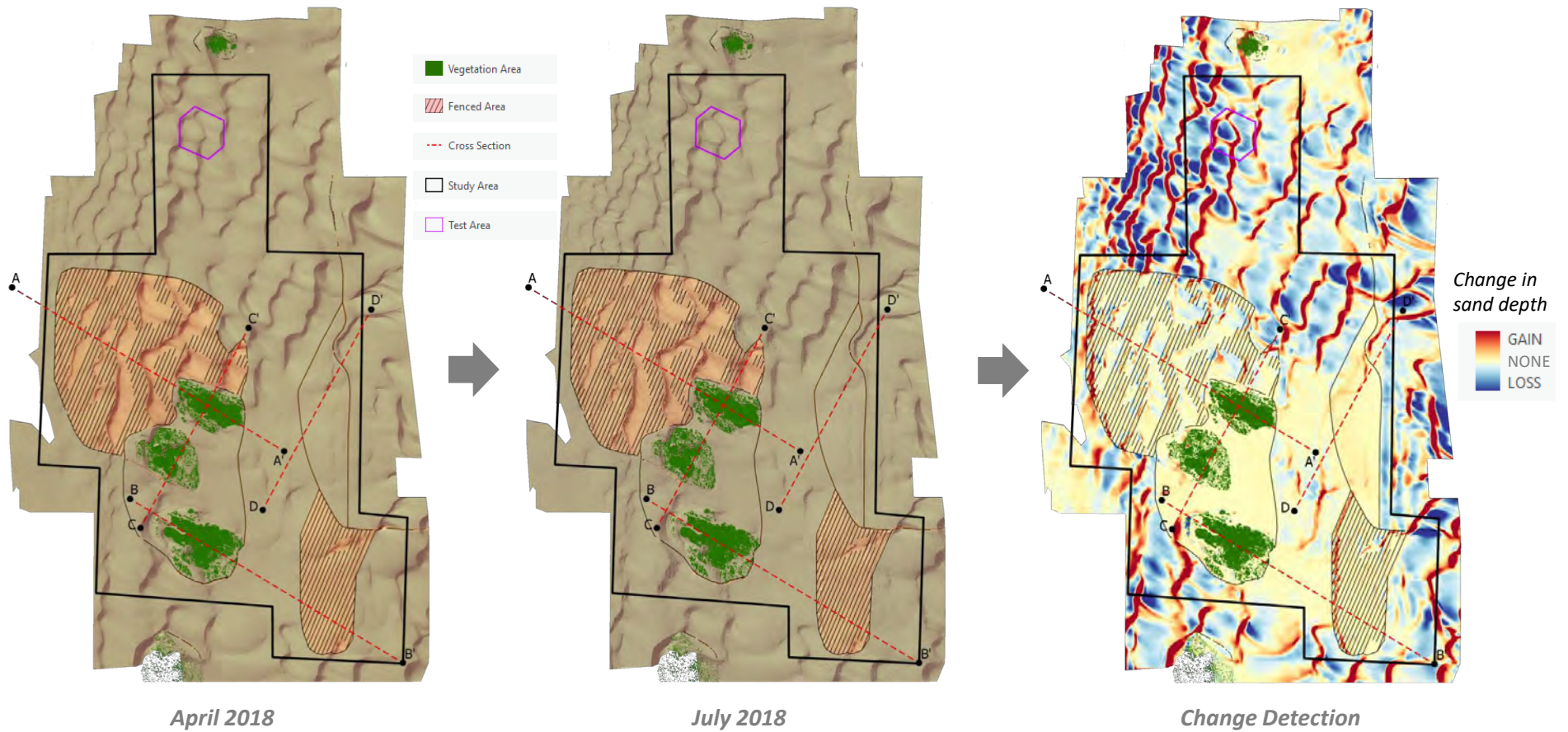
| Concentrations 24-hr PM ₁₀ (μg m ⁻³) | May-July 2013 | Exceedance Days (n=10) | 22 May 24-hr max |
|--|--------------------|---------------------------|--------------------|
| <i>Observations at CDF</i> | 50.8 | 98.5 | 169.0 |
| Model (no treatments) | 48.7 | 88.0 | 158.1 |
| Model (fenced areas 2018) | 35.8 (-26%) | 64.7 (-26%) | 118.6 (-25%) |
| Model (fenced + foredune) | 25.1 (-48%) | 44.0 (-50%) | 108.1 (-32%) |
| Model (fenced + ORA) | 11.8 (-76%) | 21.4 (-76%) | 40.9 (-74%) |
| Emissions contributing to CDF (Σ all PM ₁₀ emission areas, g/hr) | | | |
| No treatment | 181.9 | 423.3 | 534.6 |
| Fenced areas 2018 | 152.7 (-16%) | 353.6 (-16%) | 406.8 (-24%) |
| Fenced + foredune | 135.5 (-25%) | 312.2 (-26%) | 360.5 (-33%) |
| Fenced + ORA | 20.4 (-89%) | 47.8 (-89%) | 68.4 (-87%) |

Initial efforts to 2018 insufficient to meet SOA 50% reduction target

Assumes treatment areas 100% effective. % reduction values relative to bold no treatment values for upper and lower tables. Bold green values exceed a 50% reduction target. DRI (2019)

Sand Transport Mitigation & Dune Geomorphic Changes (DRI 2019)

Oceano Dunes Sand Fence LIDAR Analysis

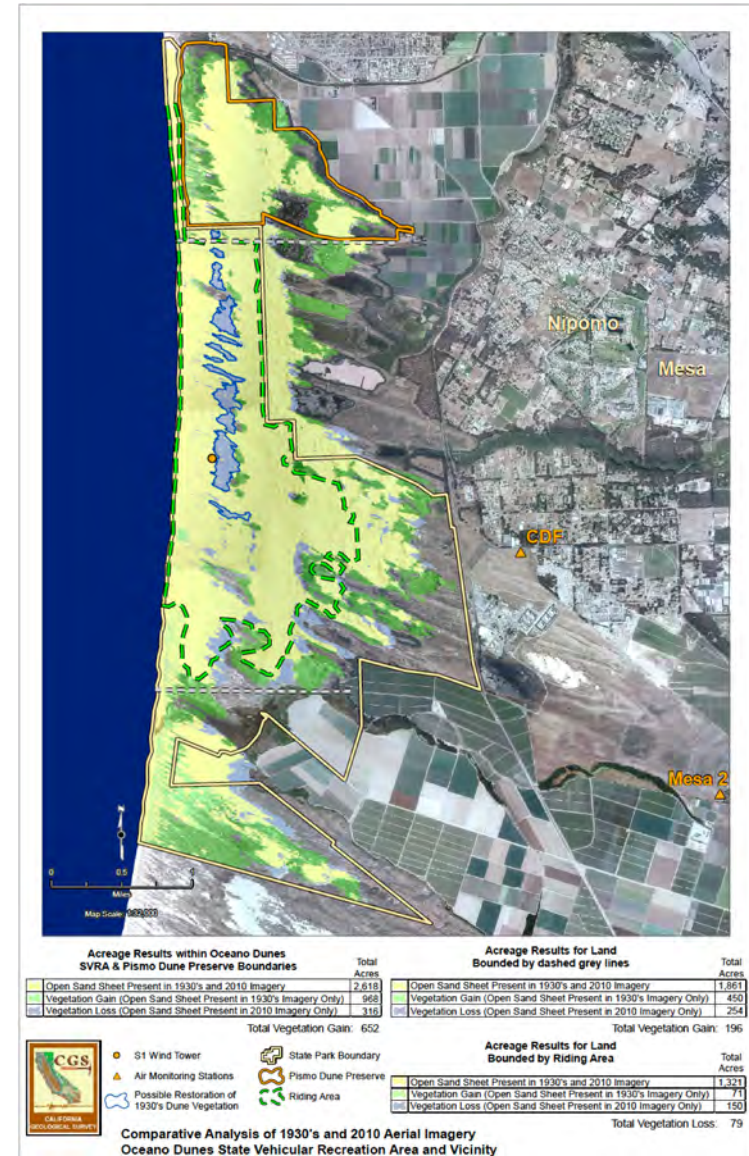


Dune Vegetation Changes

- Dune vegetation is most effective dust control measure
- vegetation cover increased by ~650 acres from 1930 to 2010
 - ~200 acres between N and S boundaries of OHV area from reintroduction of native plants E of OHV area and within “vegetation islands” by CalParks
 - began in 1982 shortly after they assumed management of ODSVRA
- although a net increase in overall plant cover in the dunes, ~80 acres was lost in OHV area
 - reduction in size of vegetation islands
 - seaward most vegetated dunes (foredunes)... this area is a key dust emission source
 - Foredune restoration within ODSVRA recommended

➤ Report provided by Will J. Harris, Senior Engineering Geologist, California Geological Survey (attachment 5 PMRP)

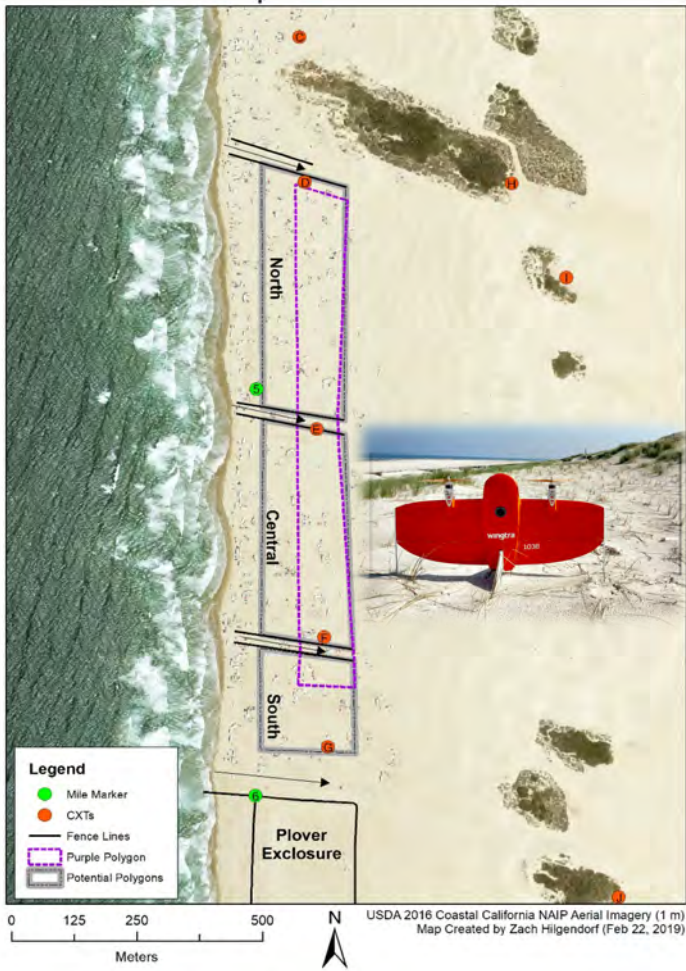
see also: California Geological Survey (2011). “In consideration of Draft Rule 1001 proposed by the San Luis Obispo County Air Pollution Control District: An analysis of Wind, Soils, and Open Sand Sheet and Vegetation Acreage in the Active Dunes of the Callender Dune Sheet, San Luis Obispo County, California.” Prepared for the Off-Highway Motor Vehicle Recreation Division of California State Parks. November 1, 2011.



Coastal Foredunes

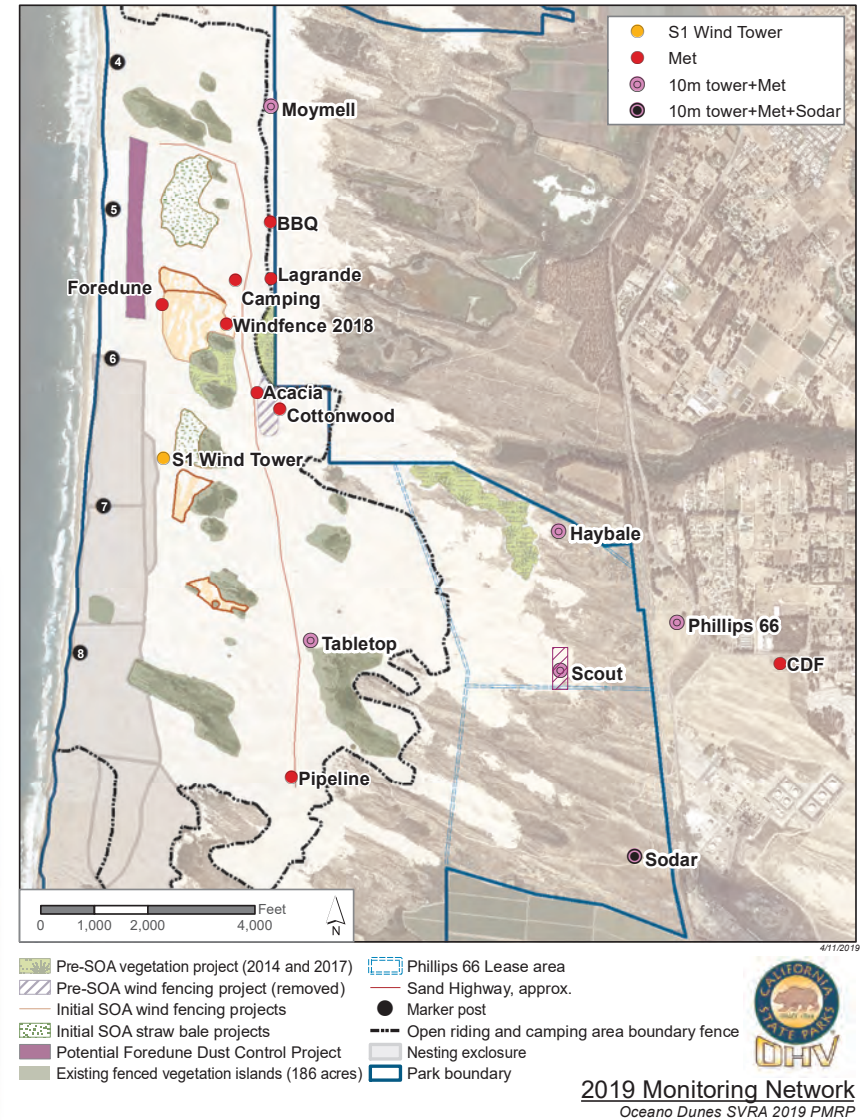


Proposed Foredune Restoration



Meteorological & Air Quality Monitoring

- Currently, limited monitoring stations within ODSVRA
 - Increase data density on winds, sand transport, PM_{10} , erosion/deposition, dune dynamics
 - improve dust emission model performance
 - assess treatment effectiveness



SAG Technical Summary

- DPMRP reviewed, endorsements, recommendations & concerns expressed to OHVMR and SLO-APCD
 - OHVMR responded with revised DPMRP 28 March 2019
- SAG, SLO-APCD, and CARB endorse the DRI source-receptor (Langrangian) dust emissions model
- Most highly emissive sites are within ODSVRA (75-81% of PM₁₀ at CDF for 10 peak days)
- Increase collection of baseline data on PM10 emissivity (PI-SWERL), dune geomorphology, and winds within ODSVRA
- Increase monitoring of meteorological, PM10, sand transport, and geomorphic conditions
 - Improve dust emissions patterns and modelling
 - Assess effectiveness of dust mitigation treatments
- Surface revegetation is most effective method to reduce dust emissions
- Foredune restoration is proposed for key highly emissive site
- PMRP is an adaptive management plan, requires continuous monitoring, assessment, re-evaluation, revision, and cooperation