



United States Department of the Interior



BUREAU OF LAND MANAGEMENT

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January 27, 2017

In Reply Refer To:
1150(CA330)

Memorandum

To: Todd Sobolik, Chief Building Official, County of Humboldt

From: Molly Brown, Field Manager, Arcata Field Office *(M. Brown (Act 3))*



Subject: Technical Memorandum in Support of Proposed Conditional Use Permit

The Bureau of Land Management (BLM) Arcata Field Office is providing the attached technical memorandum in support of a proposed conditional use permit for vegetation management actions on a county-owned parcel near the Mike Thompson Wildlife Area, South Spit Humboldt Bay (application # 10548). This memorandum is prepared in accordance with Federal Emergency Management Agency (FEMA) guidelines. The attached memorandum describes these FEMA guidelines, our methods and conclusions regarding the proposed conditional use permit. If you have any questions I may be reached at 707-825-2309.

Enclosure

Flood Hazard Evaluation of Proposed Conditional Use Permit for South Spit Vegetation Removal. (12 pp)

Technical Memorandum

From: Sam Flanagan, Geologist, 
Eric Antrim, P.E., Civil Engineer  C-74 282
Bureau of Land Management, Arcata, California

Subject: Flood Hazard Evaluation of Proposed Conditional Use Permit for
South Spit vegetation removal. County Parcel # APN 308-041-002.

25 January 2017

Introduction

This memorandum outlines our analysis of potential changes to flood hazard associated with a proposed conditional use permit for non-native vegetation removal within portions of a County-owned parcel at the southern end of the South Spit, Humboldt Bay. This memorandum has been prepared in accordance with the Federal Emergency Management Agency's (FEMA's) Guidance for Implementing 44 CFR 60.3(e)(7) (dated November 1, 2010) to analyze whether the proposed action will increase potential flood damage.

Background

The Federal Emergency Management Agency (FEMA) develops and maintains Flood Hazard Information for the National Flood Insurance Program. Management criteria for flood-prone areas are provided in 44 CFR 60.3 and have been incorporated by Humboldt County in Chapter 5 (Flood Damage Prevention) of Title III, Division 3 of the Humboldt County Code. This technical memo reviews a proposed conditional use permit for County-owned parcel #APN 308-041-002 at the southern boundary of the Mike Thompson Wildlife Area, South Spit Humboldt Bay (Figures 1 and 2). The proposed action would occur on sand dunes which are partially situated within an area designated as a coastal high hazard area (Zone VE) on FEMA's preliminary Flood Insurance Rate Map (FIRM) dated October 27, 2015. Within this zone, 44 CFR 60.3(e)(7) and Humboldt County Code §335-7(e) prohibit man-made alterations of sand dunes and mangrove stands which would increase potential flood damages.

Guidance provided by FEMA (FEMA 2010) indicates the burden of proof is on the permit applicant to demonstrate, utilizing a qualified coastal engineer or coastal geologist with

experience in coastal processes, that the proposed alteration of the sand dune does not result in any increase in flood damages. The guidance states that communities (*i.e.*, County) may issue a permit for an alteration of a dune if the evidence indicates that the alteration will not increase flood damages.

Our purpose here is to (a) describe the proposed action, and (b) provide a framework for assessing the risk of flood damage, and (c) evaluate the proposed action under this framework.

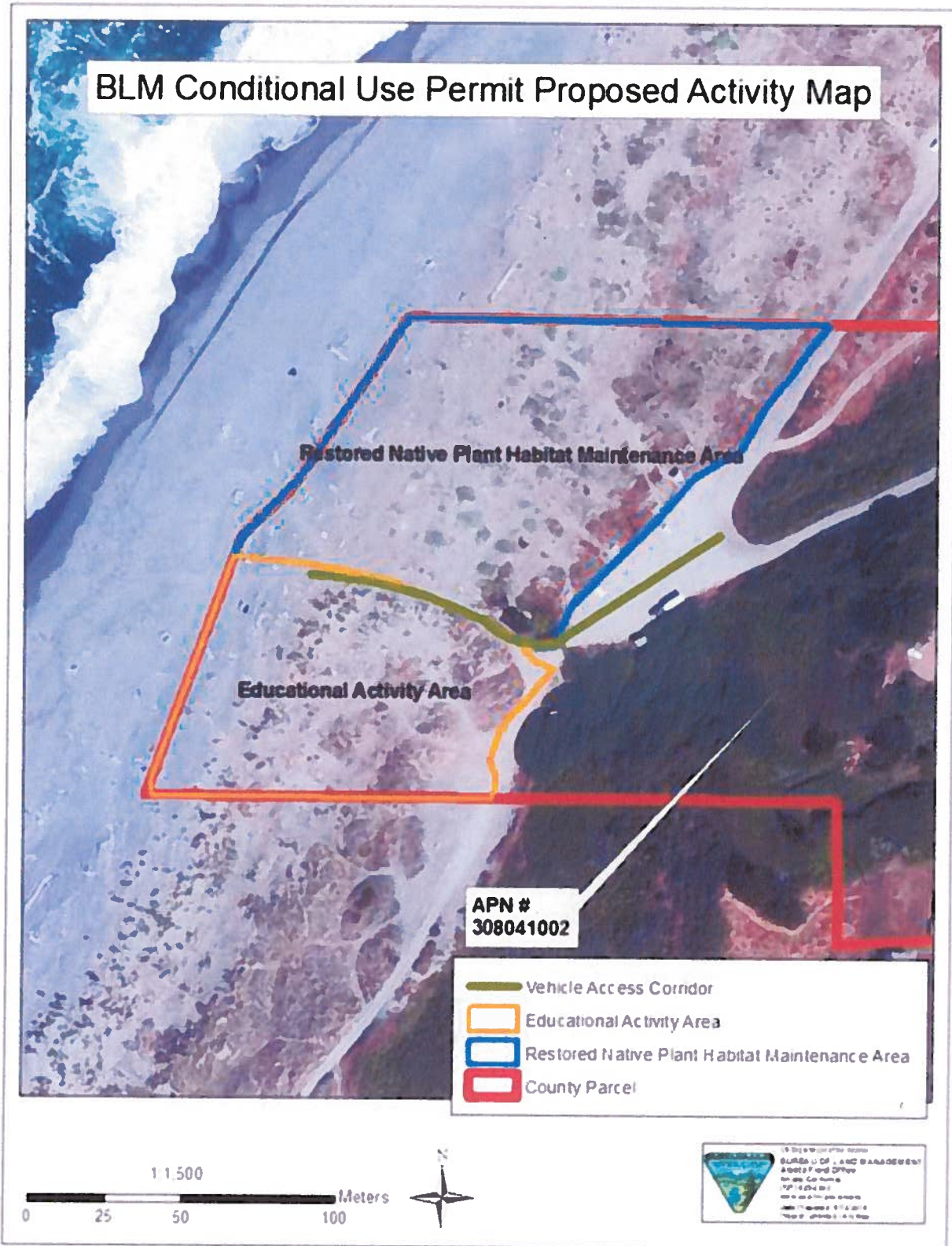


Figure 1. Location of County parcel at foot of Table Bluff.



Figure 2. Oblique view of proposed action area showing treatment dunes and BLM maintained day use area to rear of dunes at the base of Table Bluff. Copyright © 2002-2015 Kenneth & Gabrielle Adelman, California Coastal Records Project, www.californiacoastline.org

Proposed Action

The proposed action is described in detail in the Conditional Use Permit application prepared by the Bureau of Land Management. Elements of the proposed action relative to the assessment of any potential increased flood damages are considered here. The proposed action is intended to maintain the native dune vegetation by periodically removing invading, non-native vegetation. The target species for this effort is European beachgrass (*Ammophila arenaria*). However, during removal efforts, other non-native species that have invaded the area may be incidentally removed. This includes small patches of invasive iceplant (*Carpobrotus edulis*), or individuals of yellow bush lupine (*Lupinus arboreus*). Previous work indicates that native vegetation rapidly recolonizes areas where non-native vegetation is removed (BLM 2014). We note that revegetation with native plants is a requirement in the FEMA guidance for implementing 44 CFR 60.3(e)(7).

Removal of vegetation will occur by hand pulling and the use of hand tools. The frequency of removal on the subject parcel will generally occur on an annual basis. On the southern portion of the parcel, south of the vehicle access corridor, removal would occur as part of an elementary school education event. Incidental removal may also occur across the northern portion of the parcel using other hand crews. Removal efforts avoid pulling of native vegetation such that the area of disturbance is likely to be scattered across a mosaic of native vegetation.

Framework for evaluating the potential of the proposed action to increase flood damages

To evaluate the effects of the proposed action relative to guidance for implementing 44 CFR 60.3(e)(7) we consider: (1) the existence of nearby structures and human developments potentially at risk of flood damage; (2) the function of the treatment area dunes in providing flood protection to these features; and (3) the potential for dune alteration as a result of the proposed treatment. To evaluate the effects of the proposed action on increased flood damages, we consider all three of these factors in our determination. Consideration of all three factors provides multiple lines of evidence for an informed, risk-based decision process. We elaborate on these three factors below and in Figure 3:

(1) **Structures at Risk of Flood Damage.** 44 CFR 60.3(e) is focused on new construction, existing structures, manufactured homes and recreational vehicle storage sites.

Therefore, our assessment ranks the presence of these potentially flood prone structures as either:

- absent
- resilient to flooding, or
- at risk of damage from flooding

(2) **Dune functions influencing flood damage.** To describe and evaluate the function of the proposed treatment area in providing protection from flooding, we consider the specific landforms where the proposed action will occur and any offsite effects where applicable. Since this effort focuses on the coastal dune environment, we broadly consider the active wave slope, the foredune complex, intra-dune hollows and back dunes, where they exist. Each of these landforms interacts with and modifies the potential for ocean-driven flooding, dune overwash and erosion. For example, the foredunes may not provide any flood protection to areas behind the dune complex, but rather the higher

backdunes would control this. Our assessment considers the topography of the area and rates these landforms as either:

- not providing any flooding protection in light of the structures at risk, or
- providing some level of flood buffering or modification.

(3) Expected landform changes. The third area of consideration is the potential for alteration of these dune forms as a result of the proposed action. We consider empirical evidence from the local area to guide our assessment of potential changes to the physical dune environment. We rate these changes as either:

- negligible,
- change is expected but no loss of flood function (e.g. loss of dune height or continuity), or
- a degradation of the feature is anticipated such that increased flooding frequency can be expected.

FEMA guidance indicates that activities should not negatively impact natural processes. Thus we consider the role of natural processes, principally sand transport through the dunes as an integral part of our analysis.

Increased Flood Damage Risk

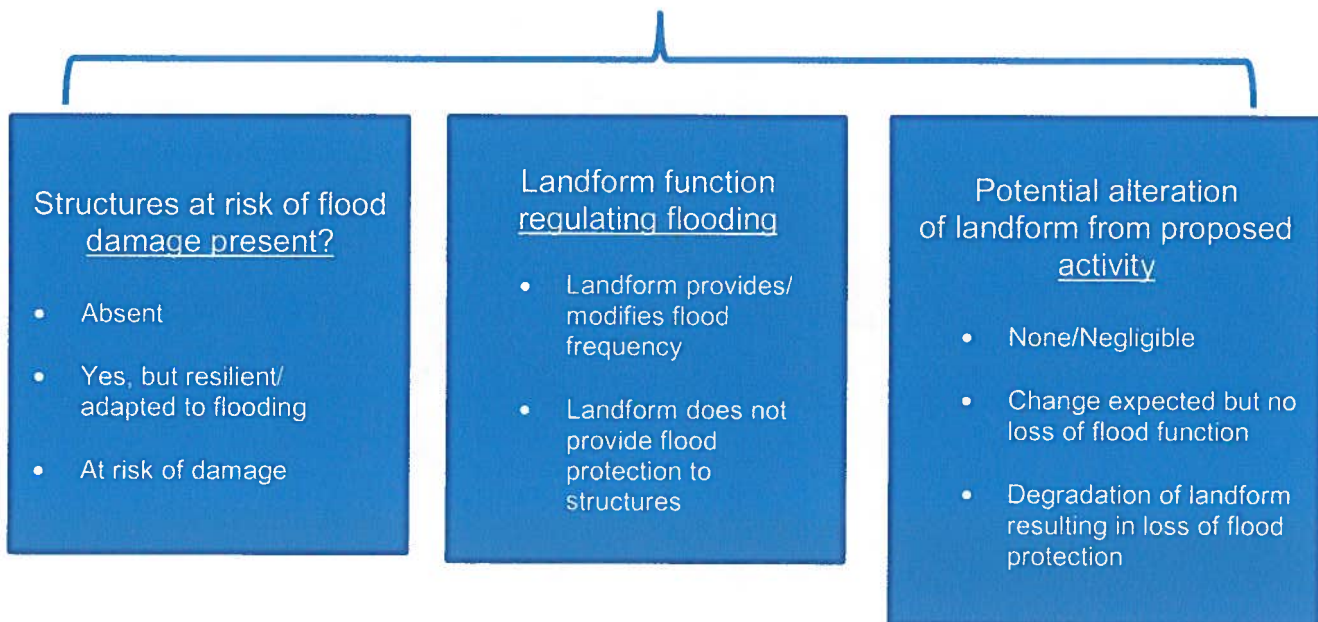


Figure 3. Our framework for evaluating the risk of flood damage from the proposed action considers the developments potentially at risk, and the role of topography in influencing potential flooding.

Evaluation of the Proposed Action

Given the framework described above, below is our discussion and evaluation of the proposed action as it relates to potential flood damage.

(1) Structures at Risk.

We assessed the area for any potential structures at risk of flood damage from activities on the subject parcel. Flooding in the proposed action area could occur from waves overtopping sand dunes during large storm events and tsunamis. The access road to the South Spit area (South Jetty Road) traverses that northeast corner of the parcel (Figure 1). At the access road switchback is a day use area maintained by the BLM, consisting of a gravel parking area and vault toilet. A four wheel drive route traverses the southern portion of the parcel over the active sand dunes, connecting the parking area and waveslope. South Jetty Road, the gravel parking area, and the vault toilet are all situated outside the VE zone shown on the October 27, 2015 preliminary FIRM (Figure 4). A portion of the vehicle access corridor is situated inside the VE zone.

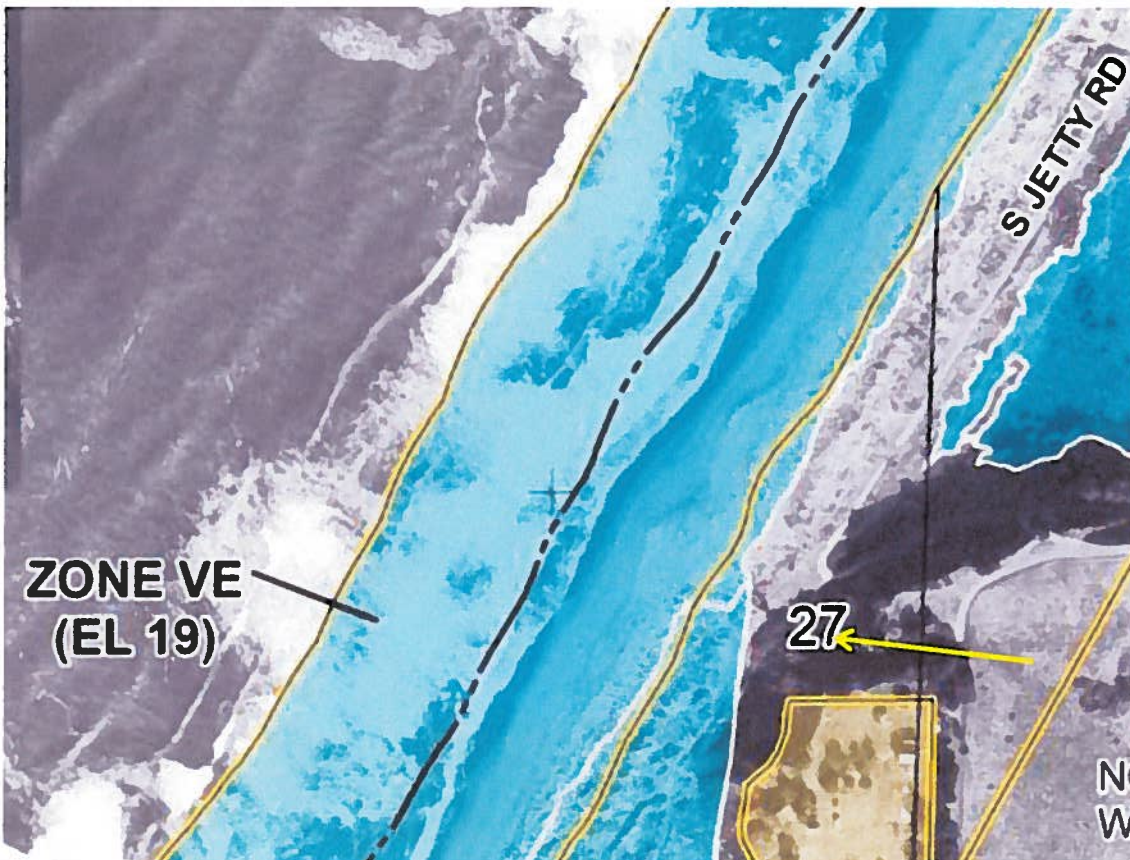


Figure 4. FEMA Flood Insurance Rate Map, Humboldt County, California, October 27, 2015. Zone VE extends up the waveslope to the first set of foredunes. Yellow arrow indicates location of day use area.

Past flooding of these areas has occurred as evidenced by scattered large driftwood pieces around the parcel. Historic aerial photos from 1939 document washover events in this location at a time when the South Spit was significantly narrower (Figure 5). However, we consider the developments in these areas to be more resilient to flooding under current conditions given that the spit is now wider, more vegetated and has more complex topography. If flooding were to occur, the developments are expected to be resilient in that they are flat surfaces not positioned in an erosive environment. Much of the erosive energy would dissipate through the dunes, spreading out across the area and quickly infiltrating. This is evidenced by the lack of erosion evidence along the base of Table Bluff where the facilities are located.



Figure 5. Aerial photo from 1939 of proposed project area showing washover events and narrower dunes.

(2) Landform functions influencing flood damage.

The proposed activities would occur on the upper edge of the waveslope, across the foredunes and into the low elevation back dunes above the Zone VE elevation (Figures 1 and 4). These features provide a mechanism for wave energy dissipation due to their elevation and complex topography. Our evaluation of the site indicates that large wave events appear to be an integral process to the form and function of these dunes. Any minor, or localized, changes that might occur here would not appreciably affect flooding of any areas of concern given the width and complexity of the dune field. We discuss potential changes to the dunes below.

(3) Expected landform changes.

The magnitude of vegetation removal in the proposed action is not expected to alter the shape of the dunes. For our evaluation, we are principally concerned with both the height and shape of the foredunes as a factor influencing wave overtopping and energy dissipation. Because the proposed action is only targeting small patches of invading vegetation, leaving the native vegetation community largely intact, we do not expect any appreciable changes in foredune morphology. We note that the scattered pattern of vegetation along the foredunes may be allowing wind transport of sand to more interior dunes and maintaining these features. Thus, we speculate that in the absence of the vegetation removal, which currently prevents re-establishment of *Ammophila*, this sand transport may diminish as European Beachgrass re-invades the foredune complex and gradual diminishment of these interior dunes might occur. In this case, a loss of important dune maintaining processes would occur. Maintaining the dynamic dune environment, particularly in areas where human developments are minimal, such as the assessment area described here, are critical for adapting to rising sea levels (see discussion below). We note that work done along the Lanphere and Ma-le'l dunes west of Arcata suggests that wholesale differences in the vegetation community do not correlate with significant differences in dune heights (McDonald 2015). This work suggests that removal of smaller patches of vegetation, as proposed, is not likely to result in appreciable changes to the dune forms.

Sea Level Rise Considerations.

Sea level rise is an increasing threat to coastal environments. The issue is particularly acute along Humboldt Bay where ongoing land subsidence is accelerating sea level rise up to 2-3 times greater than anywhere else in California (Cascadia GeoSciences 2013). Coastal dunes provide an important buffer between the ocean and low lying inland areas. The FEMA guidance

cited here prohibits alterations of dunes that would increase flooding risk and impact natural processes. These natural processes result in dunes that are ever evolving in response to a variety of factors including local tectonics, climatic fluctuations, sediment supply, vegetation, wind patterns and human development (Wiedemann 1984). Dunes are not static, nor fixed, landscape features. The ability of dunes to adapt to changing sea levels is a well-documented natural process (e.g., NRC 2012, Davis 1992, Crooks 2004). Generally, with rising sea levels, the shoreline migrates inland (retrograding shoreline) and the dunes respond by moving inland (transgressive dunes). However, the site-specific responses that accompany this are difficult to predict, and the process is not necessarily linear. For example, photo evidence suggests the dunes in the vicinity of the proposed action have widened over the past decades, most likely in response to increased sediment supply. Fore-dune erosion (and subsequent ramping) is one process by which fore-dunes translate (Davidson-Arnott 2010). Thus, we emphasize that maintaining a resilient dune system with intact natural processes and native vegetation, per FEMA guidance, are key components to accommodating sea level rise.

Conclusions

We conclude that hand pulling small patches of invading non-native vegetation will not increase potential flood damages. First, the magnitude of vegetation pulling is minor, leaving the existing native vegetation community largely intact. Any changes in dune shapes due to vegetation removal are likely to be negligible, and would not rise to a level where flooding risk is increased. Rather, it is more likely that removal of dense, sand-trapping non-native vegetation will benefit flood protection and resilience by enhancing inland sand transport and dune formation. Overall, the dunes provide some level of energy dissipation to large overtopping waves that have occurred in the past. The limited human developments near the site appear to be generally resistant to some level of periodic flooding and are intended as recreational facilities (not occupied structures). Except for a portion of the vehicle access corridor, all of the developments at the site are situated outside the designated coastal high hazard area shown on the October 27, 2015 preliminary FIRM. Therefore, the potential for increased flood damages from the proposed action appears negligible.

Citations

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