

State of Oregon  
Oregon Department of Geology and Mineral Industries  
Brad Avy, State Geologist

**OPEN-FILE REPORT O-17-02**

**STATEWIDE LEVEE DATABASE FOR OREGON, RELEASE 1.0:  
MAJOR AGRICULTURAL AND URBAN AREAS IN WESTERN OREGON  
AND ALONG THE COLUMBIA RIVER**

by Fletcher E. O'Brien<sup>1</sup>



2017

<sup>1</sup>Oregon Department of Geology and Mineral Industries, 800 NE Oregon Street, Suite 965, Portland, OR 97232

## **DISCLAIMER**

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Oregon Department of Geology and Mineral Industries Open-File Report O-17-02  
Published in conformance with ORS 516.030

For additional information:  
Administrative Offices  
800 NE Oregon Street, Suite 965  
Portland, OR 97232  
Telephone (971) 673-1555  
Fax (971) 673-1562  
<http://www.oregongeology.org>  
<http://oregon.gov/DOGAMI/>

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## **GEOGRAPHIC INFORMATION SYSTEM (GIS) DATA**

*See the digital publication folder for files.*

*Geodatabase is Esri® version 10.2 format. Metadata is embedded in the geodatabase and is also provided as separate .xml format files.*

### **SLDO\_1.gdb:**

*feature classes:*

*Levee\_Lines (polyline)*

*Protected\_Lands (polygon)*

*Special\_Districts (polygon)*

### **Metadata in .xml file format:**

Levee\_Lines\_metadata.xml

Protected\_Lands\_metadata.xml

Special\_Districts\_metadata.xml

## ABSTRACT

A geospatial inventory of levees and levee-like features is an important resource for assessing flood risk, for flood mitigation planning, and for emergency response during flood events. It also benefits ecological restoration efforts by helping locate levees to remove or breach in order to expand habitat for aquatic species. Until now, the state of Oregon did not have a single comprehensive inventory that maps levees with the high spatial accuracy needed to support these activities. To meet this need, the Oregon Department of Geology and Mineral Industries (DOGAMI) compiled pre-existing levee data and created new levee data in a single geospatial inventory.

This initial compilation includes the following spatial layers: 1) levee lines representing the centerline of levee-like features that appear to protect against flooding, 2) protected lands polygons representing parcels located behind levee line features, and 3) special district polygons representing historic and active districts for diking, drainage, or other forms of hydro-modification. The total number of features in the compilation is 6,431 levee lines, 5,352 protected lands polygons, and 69 special districts polygons, covering major agricultural and urban areas in Oregon.

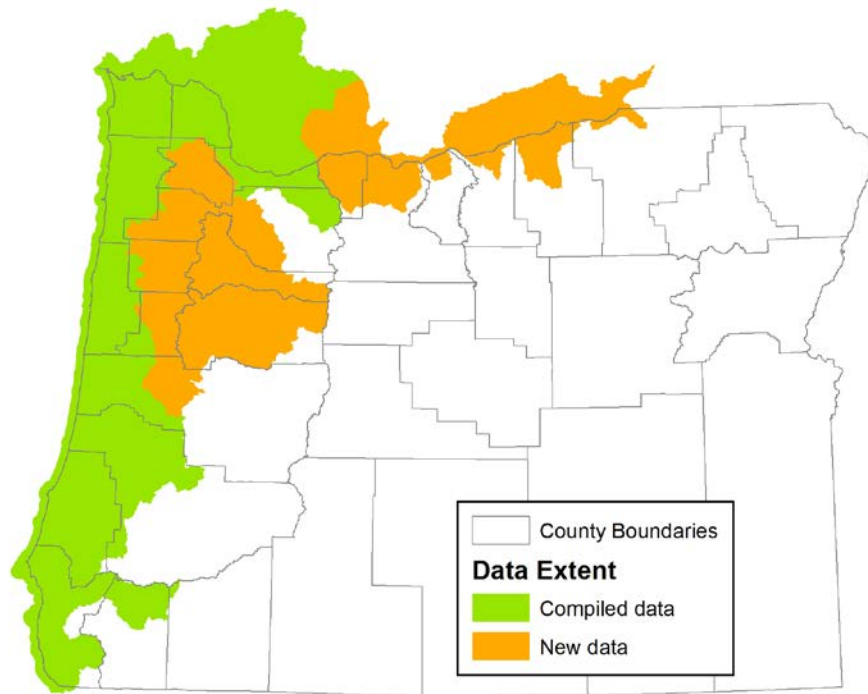
## 1.0 INTRODUCTION

Levees are built to limit flooding on adjacent lands and to manage the level of risk to property and infrastructure on those lands. Levees can also impact adjacent wetlands and habitat. Levee inventories are an important resource for assessing flood risk, for flood mitigation planning, and for emergency response during flood events. They also benefit ecological restoration efforts by helping locate levees to remove or breach in order to expand habitat for aquatic species. Levees are manmade features most commonly constructed with materials such as earthen fill, rocks, and concrete. Aside from the U.S. Army Corps of Engineers' National Levee Database (2015), which includes only a relatively small subset of existing levees and is not widely available for use in database format, no single levee inventory for Oregon existed prior to this compilation.

The purpose of the project described in this report was to compile existing spatial data and to develop new spatial data that represent levees, diking districts, and areas protected by levees into a single updatable statewide dataset. This initial release covers major agricultural and urban areas in Oregon. The project followed methodology developed by the Oregon Department of Land Conservation's Oregon Coastal Management Program (OCMP) to expand existing datasets to high-priority areas. High-priority areas were determined through coordination with members of the Flood Subcommittee (Oregon Silver Jackets) to the Statewide Interagency Hazard Mitigation Team (IHMT) (see section 8). New data were created for low-lying areas of the Willamette Basin and the Columbia River upstream of the Bonneville Dam. New and existing datasets were consolidated into a single geodatabase (**Figure 1-1**). The compilation covers the majority of agricultural and urban areas in Oregon known to have levees. The data are available from DOGAMI and via the Oregon Geospatial Data Library (<http://spatialdata.oregonexplorer.info/geoportal/>).

Spatial data layers produced by this project include: 1) levee lines representing the centerlines of levee-like features that appear to protect against flooding, 2) protected lands polygons representing parcels located behind levee line features and 3) special district polygons representing historic and active districts for diking, drainage, or other forms of hydro modification.

**Figure 1-1. Levee geospatial database extent. Compiled data are from the Oregon Coastal Management Program (Mattison, 2011), the Lower Columbia River Estuary Partnership (Mattison, 2012), and the U.S. Army Corps of Engineers (2015).**



## 2.0 PREVIOUS LEVEE INVENTORIES

Three existing levee inventories were compiled in this dataset. The original inventories were completed for the following regions: 1) estuary areas along the Oregon coast, 2) the Columbia River downstream of Bonneville Dam, and 3) the Willamette Basin and the Columbia River upstream of Bonneville Dam.

OCMP produced a levee inventory for estuary areas along the Oregon Coast in 2011. This inventory is hereafter referred to as the OCMP 2011 Coastal Dataset. It includes polylines representing levee centerlines (Mattison, 2011a) and polygons representing protected lands (Mattison, 2011b) and special districts (Mattison, 2011c). The total feature count for this dataset is 2,346 levee lines, 4,152 protected lands polygons, and 55 special district polygons. Data coverage includes portions of the following USGS 8-digit hydrologic unit (HUC-8; [https://nhd.usgs.gov/NHD\\_High\\_Resolution.html](https://nhd.usgs.gov/NHD_High_Resolution.html)) watersheds: Alsea, Chetco, Coos, Coquille, Lower Columbia, Lower Rogue, Necanicum, Nehalem, Siletz-Yaquina, Siltcoos, Siuslaw, Sixes, Umpqua, and Wilson-Trask-Nestucca (Figure 3-1).

The Lower Columbia River Estuary Partnership produced a levee inventory for the Columbia River downstream of Bonneville Dam in 2012 (Mattison, 2012). This inventory is hereafter referred to as the LCREP 2012 Lower Columbia Dataset. It includes 1,771 polylines representing levees. Data coverage includes portions of the following HUC-8 watersheds: Lewis, Lower Columbia, Lower Columbia-Clatskanie, Lower Columbia-Sandy, Lower Cowlitz, Lower Willamette, and Willapa Bay (Figure 3-1).

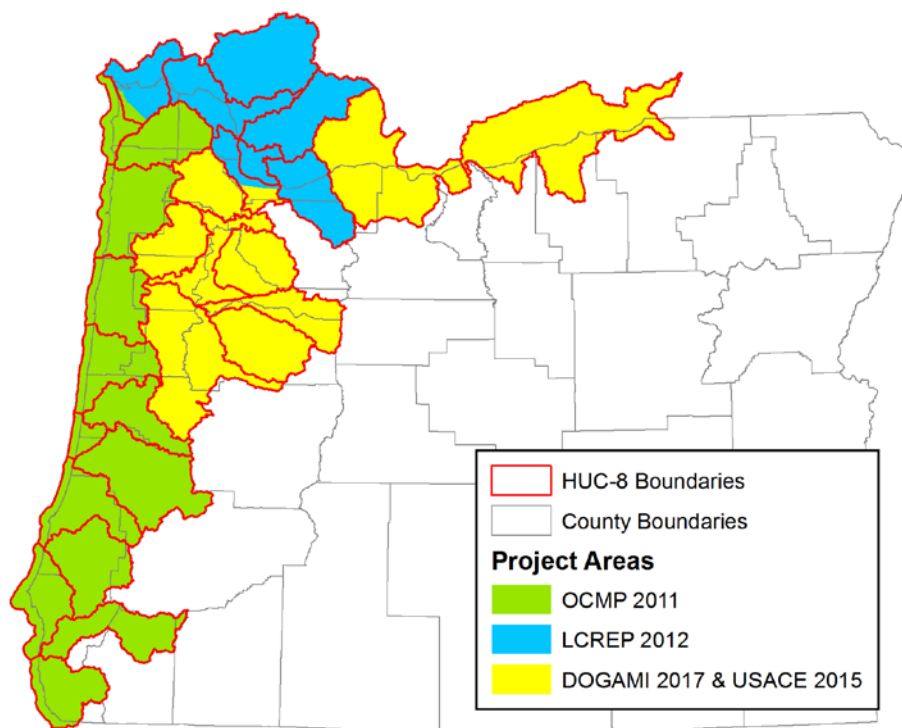
The U.S. Army Corps of Engineers (USACE) maintains the National Levee Database (NLD), which contains the majority of levees within the USACE program. Levees included in the NLD generally meet at least one of the

following criteria: 1) The USACE had a role in levee initial construction, 2) the USACE is involved in current levee maintenance, or 3) levees are in the USACE rehabilitation program. The USACE Portland District provided a subset of this unpublished database to DOGAMI in 2015. This inventory is hereafter referred to as the USACE 2015 Willamette-Columbia Dataset. Only USACE levees located within the Willamette Basin and along the Columbia River upstream of Bonneville Dam were added to this inventory. Data coverage included portions of the following HUC-8 watersheds: Lower Willamette, Middle Columbia-Hood, Middle Willamette, Molalla-Pudding, North Santiam, South Santiam, Tualatin, and Upper Willamette (**Figure 3-1**).

### 3.0 NEW DATA

New data added to the inventory, hereafter referred to as DOGAMI 2017, covered most of the Willamette Basin and the Columbia River upstream of Bonneville Dam near floodplains. Data coverage included of the following HUC-8 watersheds: Lower Willamette, Middle Columbia-Hood, Middle Columbia-Lake Wallula, Middle Willamette, Molalla-Pudding, North Santiam, South Santiam, Tualatin, Upper Willamette, and Yamhill (**Figure 3-1**). The DOGAMI 2017 study captured levee lines, protected lands, and special districts in the Willamette Basin and along lower Columbia River. The DOGAMI 2017 study excluded the following HUC-8 watersheds that were not in high-priority areas: Clackamas, Coast Fork Willamette, Lower Columbia-Sandy, McKenzie, and Middle Fork Willamette (see section 8).

**Figure 3-1. Levee inventory project areas. 8-digit hydrologic unit (HUC-8) watershed boundaries are shown. Compiled data are from the Oregon Coastal Management Program (Mattison, 2011), the Lower Columbia River Estuary Partnership (Mattison, 2012), and the U.S. Army Corps of Engineers (2015).**



## 4.0 METHODOLOGY

The following methods were used to create the Statewide Levee Database for Oregon, release 1.0:

- 1) Compilation of two datasets “as-is”: the OCMP 2011 Coastal Dataset and the LCREP 2012 Lower Columbia Dataset
- 2) Compilation of and spatial adjustment for one dataset: the USACE 2015 Willamette-Columbia Dataset
- 3) Creation of new data following methods outlined by the OCMP: DOGAMI 2017

The methodology is described in more detail in the following sections. These methods resulted in three sets of spatial data layers:

1. Lines representing the centerlines of levees
2. Polygon outlines of lands protected by levees
3. Polygon outlines of special districts

These three spatial data layers are included in the geodatabase published with this report.

### 4.1 Compilation of Coastal and Lower Columbia datasets

The OCMP 2011 Coastal Dataset and the LCREP 2012 Lower Columbia Dataset had an area of overlap in the Columbia River estuary. Because the LCREP 2012 Lower Columbia Dataset was newer, where the two datasets overlapped, the older, duplicate OCMP 2011 Coastal Dataset lines were removed (**Figure 4-1**). Most original attributes from these datasets were carried through into the compilation; attributes with undefined, unclear or non-replicable coded values were not included.

### 4.2 Compilation and spatial adjustment of the Willamette-Columbia dataset

The USACE 2015 Willamette Basin and Upper Columbia River Dataset was visually inspected by using lidar digital elevation models (DEMs) acquired through the Oregon Lidar Consortium (<http://www.oregongeology.org/lidar/>). If the levee centerlines in the original dataset matched the locations of levees in the lidar DEM, they were incorporated “as is.” If they did not match the lidar DEM, the lines were adjusted to match (**Figure 4-1**), and edited lines were indicated in the attribute table (DGMI\_NLD field). Only some of the original attributes were carried through to the compilation; attributes with undefined, unclear, or non-replicable coded values were not included.

### 4.3 Creation of new data

Within the Willamette Basin and along the Upper Columbia River, previously unmapped levees were mapped as part of the 2017 DOGAMI study (**Figure 4-1**). In general, the methods used in the OCMP 2011 Coastal Dataset were followed. Levee features were located and mapped visually by using lidar DEMs (<http://www.oregongeology.org/lidar/>). A combination of elevation and bare earth slope symbology was used as the primary identification method (see **Appendix A: Examples of Levee Features**). Orthoimagery from 2016, which was typically more current than the lidar DEM, was used to verify the lines and to adjust, add, or remove lines as necessary.

Several different types of levee-like features were captured during data creation. These feature types included levees, dams, jetties, pond perimeters, railroads, roads, berms and gravel pit perimeters. Figures in **Appendix A: Examples of Levee Features** illustrate these levee features.

The general requirements for data capture were that levee-like features be at least 3 feet tall on the landward side and appear to function as a barrier to flooding. In addition to the minimum height and functional requirement,

features were generally required to exhibit a “levee-like” shape, that is, a continuous linear feature that had uniformly sloped sides and a flat top. Features that appeared overly fragmented or notched were not added to the database.

The minimum height rule did not apply in two situations. First, all USACE 2015 Willamette Basin and Upper-Columbia Dataset levee line features, including those less than 3 feet tall, were included. Second, if a feature appeared to function as a barrier to a Special Flood Hazard Area (<https://www.fema.gov/special-flood-hazard-area>) mapped by the Federal Emergency Management Agency (FEMA), the feature was included regardless of height. This resulted in a number of additions to the database of road and railroad features that were less than 3 feet tall.

Levee-like features were assigned a confidence value. This was the degree of certainty that a feature was manmade and designed to function as a levee. This value was captured in the spatial data layer and was applicable to only the USACE 2015 Willamette-Columbia Dataset and new data created as part of the DOGAMI 2017 study.

High confidence levees were well-defined manmade levee features clearly designed to protect low-lying areas from flooding. These were continuous features of mostly uniform height, generally flat on the crest, and had undamaged banks. Medium confidence levees were less well defined manmade levee features clearly designed to protect low-lying areas from flooding. Unlike high confidence levees, these features exhibited problems with their shape including: 1) fragmented segments, 2) varying heights often including low points, and 3) damaged or notched banks (see **Appendix A: Examples of Levee Features**). USACE 2015 Willamette-Columbia Dataset levees were considered high confidence features and did not have a minimum height requirement.

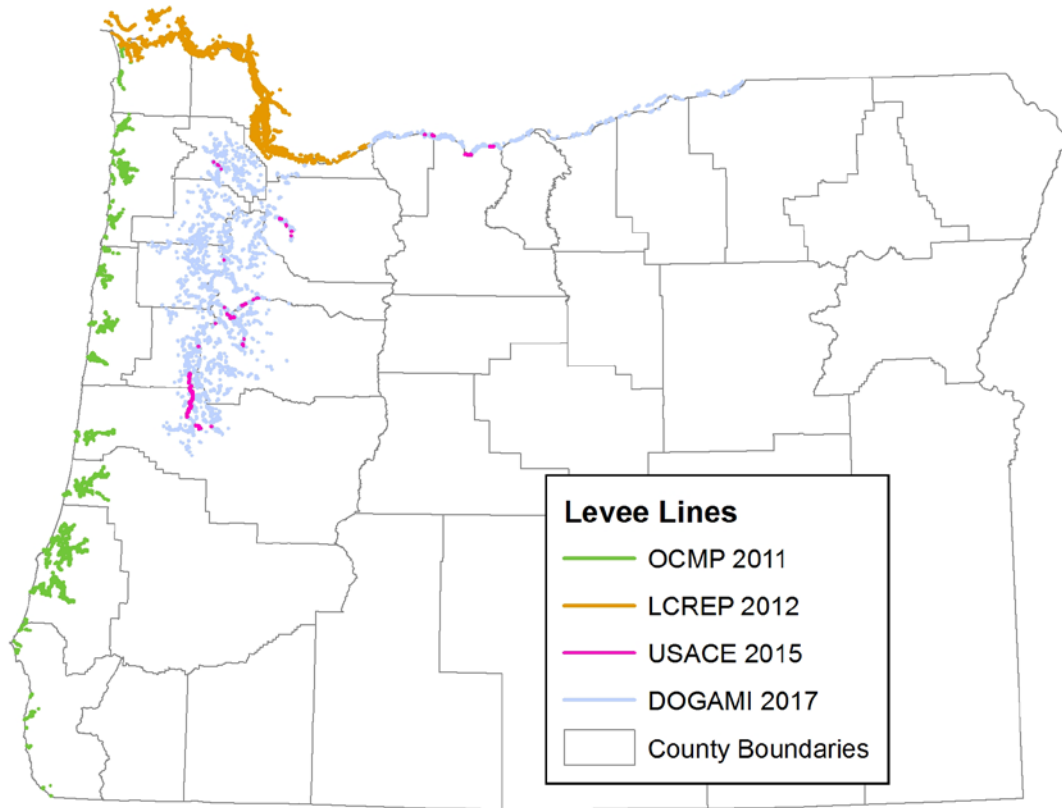
Dams, jetties, and pond perimeter features that had well-defined shapes, a minimum height of 3 feet, and were located inside or adjacent to the floodplain were considered medium confidence features. Although these features have different purposes than levees, they were included because they are shaped like levees and act as hydraulic obstructions in floodplains.

Railroads and roads that functioned as barriers to flooding and had a minimum height of 3 feet were considered medium confidence features. Some of the features included were partial barriers, such as a bridged railroad grade at the mouth of a tributary. Due to the extremely large number of roads and railroads existing in floodplains, only features that appeared to function similarly to levees were included.

Berms, although designed for purposes other than flood control, such as barriers between houses and roads, can also act as hydraulic obstructions in floodplains. Berms that were physically very similar to levees, had well-defined shapes, a minimum height of 3 feet, and were located inside or adjacent to a floodplain were included. Berms were all considered to be medium confidence features.

Gravel pits were physically very similar to levees and were located inside or adjacent to a floodplain. They had a minimum height of 3 feet and a maximum crest width of 100 feet. Gravel pits were considered medium confidence features. It was common for gravel pits to be filled with water, and some of them appeared to be used as functioning ponds.

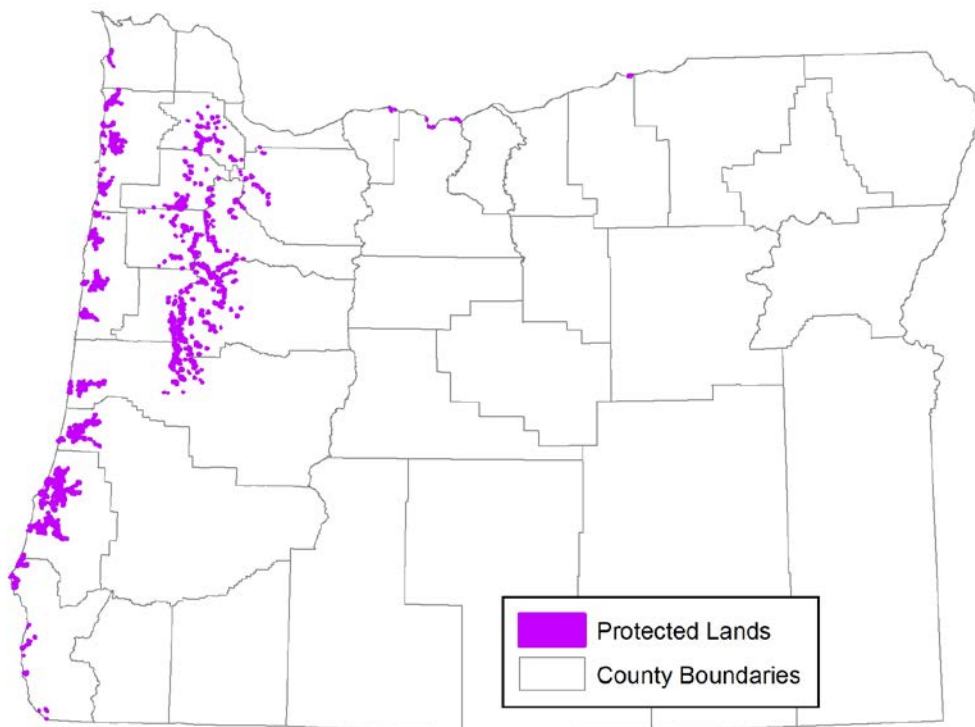
**Figure 4-1. Levee lines in the inventory and data sources. Distribution of new and compiled levee lines in the inventory. Compiled data are from the Oregon Coastal Management Program (Mattison, 2011), the Lower Columbia River Estuary Partnership (Mattison, 2012), and the U.S. Army Corps of Engineers (2015).**



#### 4.4 Protected lands

Protected lands are defined in the levee inventory as areas located behind one or more levee line features ([Figure 4-2](#)). Protected lands from the OCMP 2011 Coastal Dataset were incorporated “as is.” The LCREP 2012 Lower Columbia Dataset did not include any protected lands polygons. In the DOGAMI 2017 study, parcels from 2015 or 2016 county tax lot datasets (used by permission of Oregon Department of Revenue) were selected solely on the basis of parcel’s relative position to the levee lines. The elevations of the parcels were not compared to FEMA base flood elevations, and no flood modeling was performed to assess these boundaries.

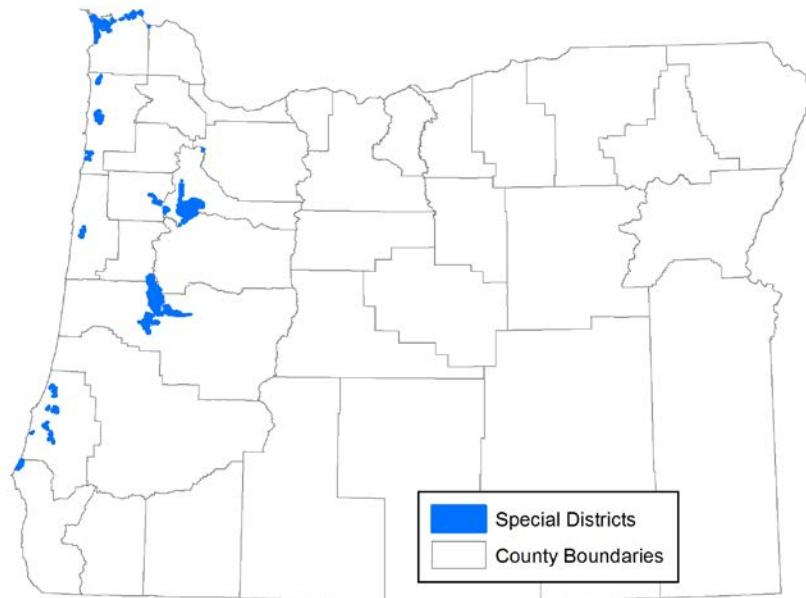
**Figure 4-2. Protected land polygons in the levee inventory.**



## 4.5 Special districts

Special districts represent historic and active districts for diking, drainage, or other forms of hydro-modification ([Figure 4-3](#)). The OCMP 2011 Coastal Dataset special districts were incorporated “as is.” The LCREP 2012 Lower Columbia Dataset did not include any special district polygons. In DOGAMI 2017, special district boundaries were extracted from county tax code datasets, county special district layers, or legal descriptions found in county commissioner records.

Figure 4-3. Special districts in the levee inventory.



## 4.6 Attributes

Each of the three spatial data layers in the levee inventory database has a number of corresponding attributes. Some attributes are applicable to all features while others are applicable only to specific project sources. Attributes that were not applicable to a specific project source were populated with a “-7777” entry; all empty attributes were populated with a “-9999” entry. See [Appendix B: Levee Inventory Attributes](#) for a list of applicable fields in each spatial data layer.

The REF\_ID\_COD attribute field, which is present in all three spatial layers, records the project source at the feature (row) level. It is the shorted code to the full reference to the original project. [Appendix C: Levee Inventory Source Data Definitions](#) provides a list of all REF\_ID\_COD values for this project.

Attribute descriptions for each spatial layer are provided in [Table 4-1](#), [Table 4-2](#), and [Table 4-3](#). [Appendix B: Levee Inventory Attributes](#) provides additional information about all the attributes, such as applicable data sets and example values.

**Table 4-1. Levee line attributes in the levee inventory. See Appendix B for more information.**

Field	Description	Field	Description
LEVEE_ID	Unique identifier for the levee feature.	MANAGER	Managing agency, organization, or individual.
SOURCE_CIT	Project source dataset of the feature. This is an alternative version of the REF_ID_COD field.	SOURCE	Primary source for finding the structure.
JURISDICTI	Jurisdiction where feature is located.	DGMI_NLD	DOGAMI 2017 notes about USACE NLD levee lines.
DGMI_CLASS	DOGAMI 2017 classification of the structure.	NLD_LEV_ID	The Primary Key in the USACE levee_centerline feature class. Refers back to the original USACE lines in NLD.
CLASS	OCMP 2011 and LCREP 2012 classification of the structure.	NLD_SEG_ID	Foreign Key link to the associated USACE FC_SEGMENT table. Refers back to the original USACE lines in NLD.
CONFIDENCE	Degree of confidence that the feature functions effectively as a levee.	BANK	Describes the location of the levee centerline in relation to the waterbody.
PROT_ASSET	Protected asset; describes what the feature is protecting.	ACCESS	Indicates if the levee feature is a partial or complete barrier to fish/flow.
HEIGHT	Average height of levee segment on landward side estimated using bare earth lidar DEM. Units are in feet.	ACCESS_TYP	Indicates the types of features providing flow access through the levee.
SFHA	Indicates if the feature appears to function as a barrier to FEMA Special Flood Hazard Area.	VERIFICATI	Indicates if the feature has been reviewed and verified with local experts.
COMMENTS	General comments.	MATERIAL	Primary material the structure consists of.
HUC8_CODE	HUC-8 watershed code populated from the Watershed Boundary Dataset (WBD).	DUAL_USE	Indicates if the structure is used for any other function than flood control.
HUC8_NAME	HUC-8 watershed name populated from the WBD.	DUAL_DESCR	Description of the dual use of the structure.
ADJ_WATER	River or stream that acts as the source of potential flooding effecting the structure.	PHYSICALIT	Additional note about the levee feature.
SWCD	Associated Oregon Soil and Water Conservation District Zone.	WATERSHED	OCMP 2011 and LCREP 2012 and watershed name.
DISTRICT	Associated special district.	REF_ID_COD	Reference identification code.
CONTACT	Contact information for the local expert or landowner who verified the structure.		

**Table 4-2. Protected land attributes in the levee inventory. See Appendix B for more information.**

Field	Description	Field	Description
PROT_ID	Unique identifier for the protected land.	LAND_USES	Land use type assigned to the parcel based on zoning defined in the DLCD Oregon Zoning layer (9/24/2014).
SOURCE_CIT	Project source dataset of the feature. This is an alternative version of the REF_ID_COD field.	NWI_CLASS	The National Wetland Inventory classification(s) of the parcel based on the U.S. Fish and Wildlife Service National Wetlands Inventory (2015).
TAXLOT	The taxlot parcel unique identifier as assigned by the county.	COMMENTS	General comments.
JURISDICTI	Jurisdiction that the parcel is located in.	OCMP_WATER	OCMP 2011 watershed name.
OWNER_TYPE	Owner type of parcel. DOGAMI 2017 determined owner type by using the Oregon Public Land Ownership 1993 (accessible via the Oregon Spatial Data Library). OCMP 2011 data determined owner type using county assessor data.	OCMP_SUBWA	OCMP 2011 subwatershed name.
		REF_ID_COD	Reference identification code.

**Table 4-3. Special district attributes in the levee inventory. See Appendix B for more information.**

Field	Description	Field	Description
DISTRIC_ID	Unique identifier for the special district.	STATUS	Indicates if the district is still active.
SOURCE_CIT	Project source dataset of the feature. This is an alternative version of the REF_ID_COD field.	COUNTY	County name where the district is located.
NAME	District name. Some districts may have aliases stated in the notes.	CONTACT	District contact if known.
YEAR	Year of district founding if known.	SOURCE	Source of the district boundary.
		NOTES	Any further relevant information.
		ESTUARY	Estuary name where the district is located.
		REF_ID_COD	Reference identification code.

## 5.0 RESULTS AND DISCUSSION

This project resulted in the creation of the Statewide Levee Database for Oregon, release 1.0, covering major agricultural and urban areas in western Oregon and along the Columbia River. This is a comprehensive levee GIS dataset in Oregon through the compilation of the OCMP 2011 Coastal Dataset and LCREP 2012 Lower Columbia Dataset; incorporation and spatial adjustment of the USACE 2015 Willamette-Columbia Dataset; and creation of new data following methods outlined by the OCMP. The new data added in DOGAMI 2017 included 2,229 levee lines, 1,186 protected lands polygons, and 22 special districts polygons.

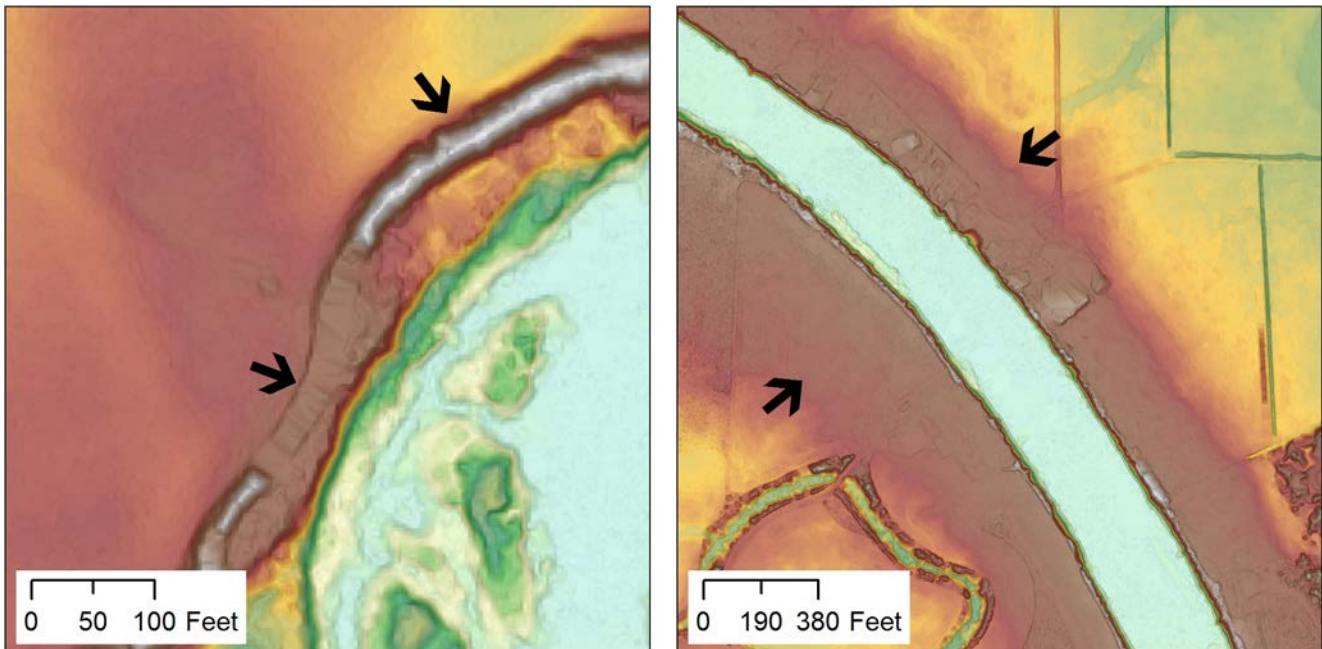
While the Willamette Basin and the upper Columbia River possessed a moderate number of levees, protected lands and special districts, the area contained fewer features than previous inventories. Additionally, individual levee segments were on average much longer in the previous inventories. These differences suggest that levees serve a more important role in coastal estuaries and along the lower Columbia River than they do in the Willamette Basin and the upper Columbia River.

## 6.0 LEVEE INVENTORY DATA AND LIMITATIONS

The levee lines spatial data layer is a compilation of mapped levee features from four sources. Most of these lines were identified and digitized by using lidar DEMs and orthophotos. Because this compilation was largely an interpretative exercise, it is important to understand that the levee lines spatial data layer has following limitations: 1) there is some inconsistency between the different sources; 2) it is missing some existing levees; and 3) it represents some levees that no longer exist. The first limitation was due to two reasons. First, there were no firm, objective guidelines used by any of the sources to determine what qualifies as a levee feature. In the case of new features created as part of DOGAMI 2017, if the feature was at least 3 feet tall, appeared manmade, displayed a levee-like shape, and was oriented in such a ways as to protect from flooding, then the feature was digitized in the database. The other sources used their own similar sets of qualitative guidelines.

The second limitation was due to uncertainty in interpreting the lidar and to errors in the lidar itself ([Figure 6-1](#)). Oftentimes the existence of a manmade levee feature was unclear because the lidar was not adequately convincing. It could be especially challenging to distinguish between a natural levee and a manmade levee. It is important to note that new levees mapped in DOGAMI 2017 did not include any “natural levee” features. The OCMP 2011 Coastal Dataset and LCREP 2012 Lower Columbia Dataset did include natural levees ([Figure 6-1](#)).

**Figure 6-1. Lidar interpretation of levee-like features. Arrows indicate levee edges. Left: Missing bare earth lidar DEM data in an area where a levee potentially exists. Right: An example of an OCMP 2011 Coastal Dataset natural levee. Because they were often difficult to define, DOGAMI 2017 did not map new natural levees.**



The third limitation was due to ground conditions changing after lidar acquisition. Lidar as old as 2007 was used to digitize levee features; much of the Willamette Basin had 2009 lidar coverage. Levee features identified in years-old lidar had the potential for erosion or removal. Orthophotos were used to check this, but they did not always provide a clear enough image to identify changes.

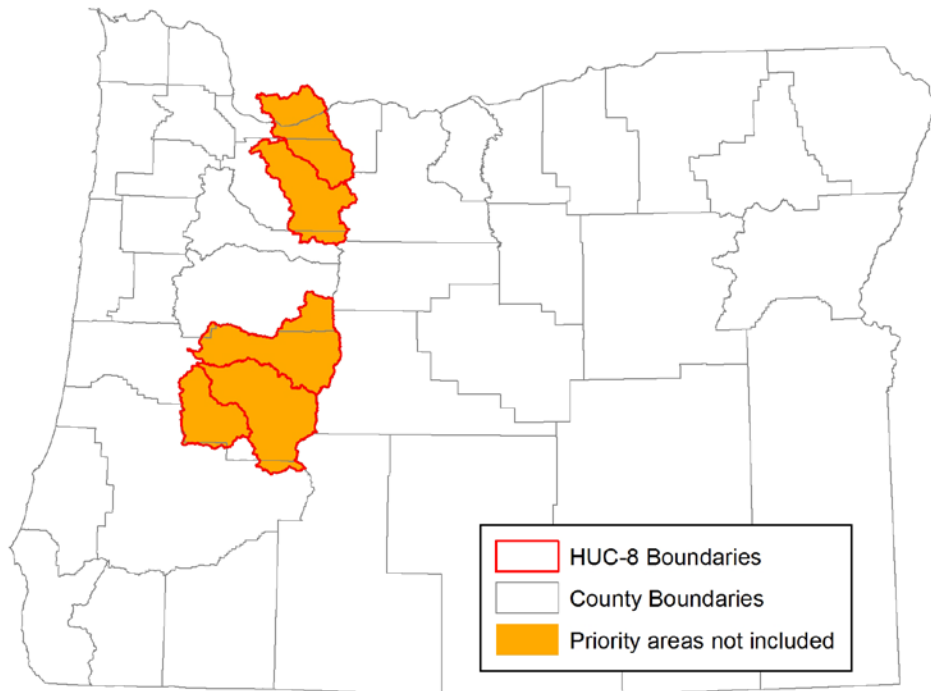
Protected lands represent parcels protected by levee features. Protected lands polygons were limited because they were based solely on their relative position to the levee lines. The elevations of the parcels were not compared to FEMA base flood elevations, and no flood modeling was performed to assess these boundaries. Two other significant limitations were that many parcels were either very large or were multi-part polygons, and this dramatically over represented the area actually protected by levees.

The special districts layer is incomplete. It is undoubtedly missing a number of districts that were not discovered during research. Boundary accuracy was assumed good when the special district boundary was taken from a county-provided GIS layer where available. However, when special district boundaries were digitized from historical legal descriptions, the accuracy of the boundaries were anywhere between good and poor.

## 7.0 RECOMMENDATIONS AND UPDATES

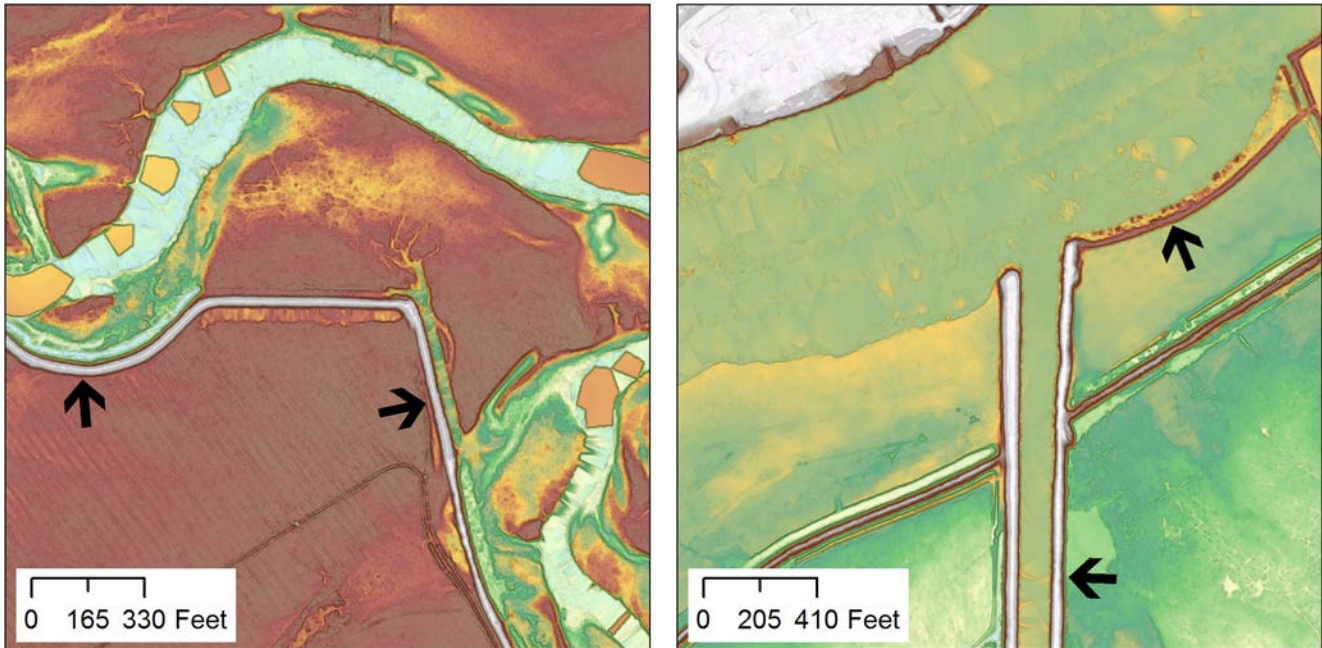
This project compiled existing data and created new data to cover as much of the Willamette Basin as possible with the funds available. Because the number of levee features was unknown at the outset, HUC-8 watersheds were prioritized to ensure a core area was completed with available funds. Priority areas were determined through coordination with members of the Flood Subcommittee (Oregon Silver Jackets) to the Statewide Interagency Hazard Mitigation Team (IHMT) primarily for flood management purposes and secondarily for ecological restoration considerations. Of the four defined priority areas, only the lowest priority area was not covered in DOGAMI 2017. This area was the Willamette Basin portions of the following HUC-8 watersheds: Clackamas, Coast Fork Willamette, Lower Columbia-Sandy, McKenzie, and Middle Fork Willamette (**Figure 7-1**).

**Figure 7-1. Priority areas not included in DOGAMI 2017.**



To identify additional locations with unmapped levees, a rough visual search of all areas with lidar coverage in Oregon was made. This search revealed that Klamath County has a significant number of levees that do not appear to be mapped in any datasets. These levees are located along the Sprague River, the Lost River, Klamath Lake, and the Klamath River below Klamath Lake. **Figure 7-2** shows examples of levees in this area. While it is clear that this area has many levees, this project did not determine whether any parties are interested in seeing them included in a levee inventory.

**Figure 7-2. Klamath County levee examples. Arrows indicate levee edge. Left: Directly downstream from the City of Klamath Falls on the Klamath River. Right: On the Sprague River.**



## 8.0 POTENTIAL USES OF LEVEE DATA

In areas without levee inventories the sole geospatial resource for levees is the USACE NLD, which includes only levees built or maintained by USACE and is not publicly available. This is a small subset of actual levees, as illustrated by comparing the number of features identified along the Oregon coast: in the NLD there are approximately 25 features; in OCMF's inventory dataset there are approximately 2,000 features.

It is important to know the locations and basic characteristics of levees for a variety of reasons. Flooding is a prevalent and costly natural hazard for the state of Oregon. Levees are built to limit flooding on lands adjacent to rivers and, to varying degrees, manage the level of risk to property and infrastructure on those lands. Understanding how much risk is mitigated by levees is critical to the FEMA's National Flood Insurance Program (NFIP).

State coordination with FEMA on the NFIP is primarily directed through the Oregon Department of Land Conservation and Development (DLCD), which houses the Risk MAP Coordinator and NFIP Coordinator for Oregon; both work closely with FEMA to prioritize flood studies and flood mitigation strategies. The need they have expressed for an expanded inventory was the primary impetus to pursue this project.

Through the Oregon Silver Jackets, other agencies have expressed a need to expand levee inventories, including FEMA Region 10, USACE Portland District, and the Oregon Water Resources Department (OWRD). Oregon Silver Jackets meets six times a year to work on flood-related issues. The group has regular participation from DLCD, DOGAMI, OWRD, USACE, FEMA, Oregon Emergency Management (OEM), U.S. Geological Survey (USGS), the Natural Resources Conservation Service (NRCS), and the National Weather Service (NWS). In the event of a major flood, Oregon Silver Jackets will support disaster response efforts in a variety of ways, and knowing where vulnerable levees are located is critical. This inventory will help planning, response, and recovery for major flood

events by providing a comprehensive base dataset to rely on and build upon. Due to its importance, the USACE Portland District provided leverage funds to this project.

Levee inventories are also important for ecological planning and restoration efforts. Levees contribute to loss of wetlands, which have a variety of important habitat functions. This inventory will help support the efforts of numerous agencies involved restoration efforts that work to remove or breach levees to reconnect wetlands to rivers. This dataset helps their work by identifying previously unknown levees and by providing an inventory that can contribute to prioritization of restoration projects. Agencies and entities that have expressed support for this project include the Oregon Watershed Enhancement Board (OWEB), the Oregon Department of State Lands (DSL), the Willamette Partnership, and the McKenzie River Trust. See [Table 8-1](#) for a summary of business needs for an expanded levee inventory.

**Table 8-1. Levee inventory business needs for the state of Oregon.**

<b>Agency</b>	<b>Business Need</b>
IHMT, DLCD, DOGAMI, OEM, FEMA, USACE, local governments	Flood hazard mitigation
DOGAMI, USACE, FEMA	Flood studies
DLCD, FEMA, local governments	NFIP administration
USACE, OEM, NWS, USGS, FEMA	Flood forecast and warning
OWRD, USACE	Levee stability assessment
OEM, FEMA, local governments	Emergency response
OEM, FEMA, local governments	Disaster recovery
OWEB, DSL, NRCS, ODFW, USFS, BLM, BPA, watershed councils	Habitat restoration
ODFW is Oregon Department of Fish and Wildlife; USFS is U.S. Forest Service; BLM is U.S. Bureau of Land Management; BPA is Bonneville Power Administration.	

## 9.0 ACKNOWLEDGMENTS

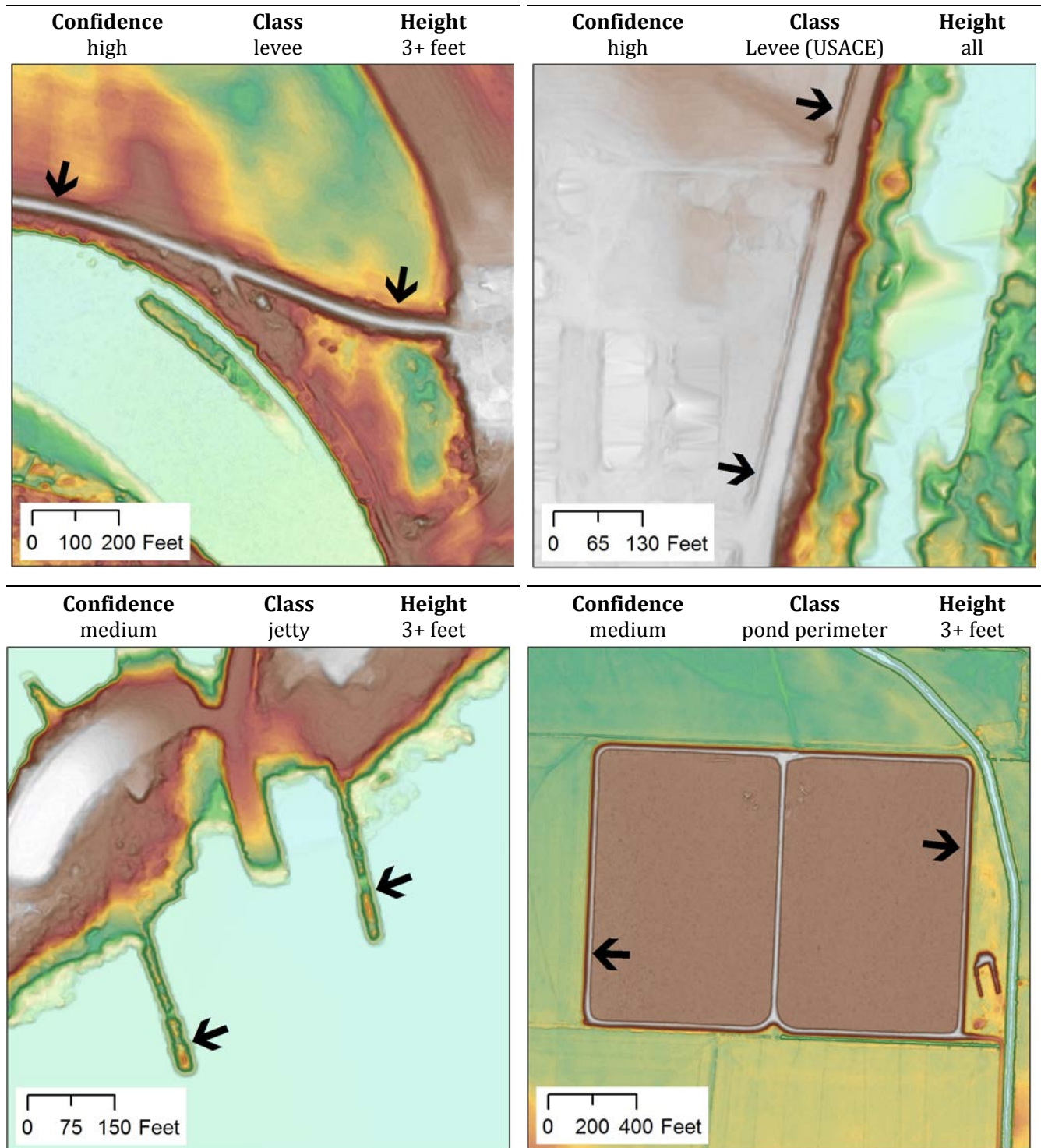
The Oregon Geospatial Enterprise Office (Interagency Agreement #106100) and the USACE Portland District (Task Order W9127N-13-2-0002-0003) provided funding for this project. I thank Bill Burns and John Bauer at DOGAMI for their detailed review of the report and GIS data; Deb Schueller at DOGAMI for assistance in publication; Laura Mattison for her work on the OCMP 2011 Coastal Dataset and LCREP 2012 Lower Columbia Dataset; and Paul Sclafani at USACE for providing the USACE 2015 Willamette-Columbia Dataset.

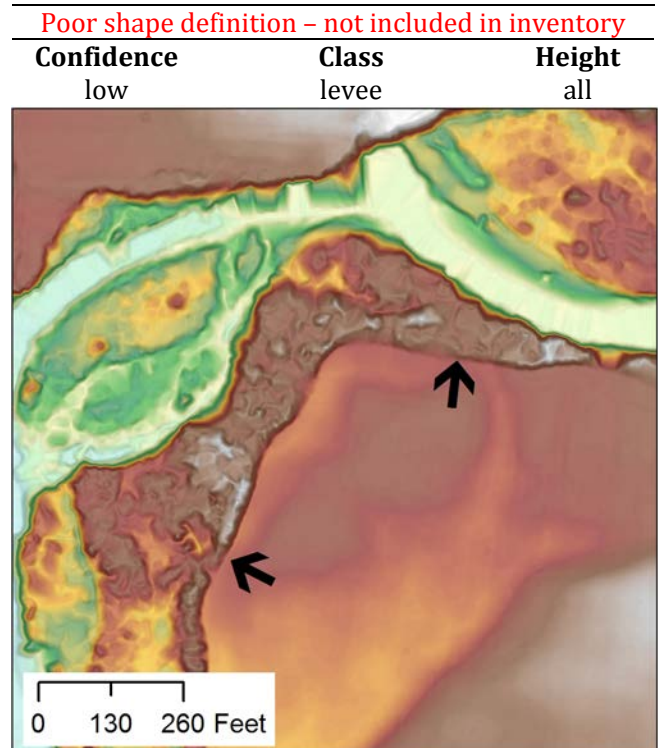
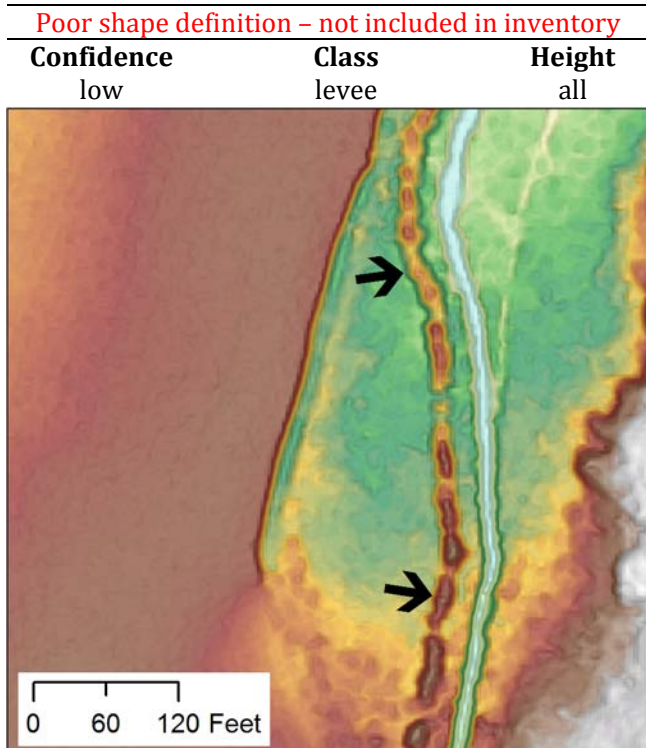
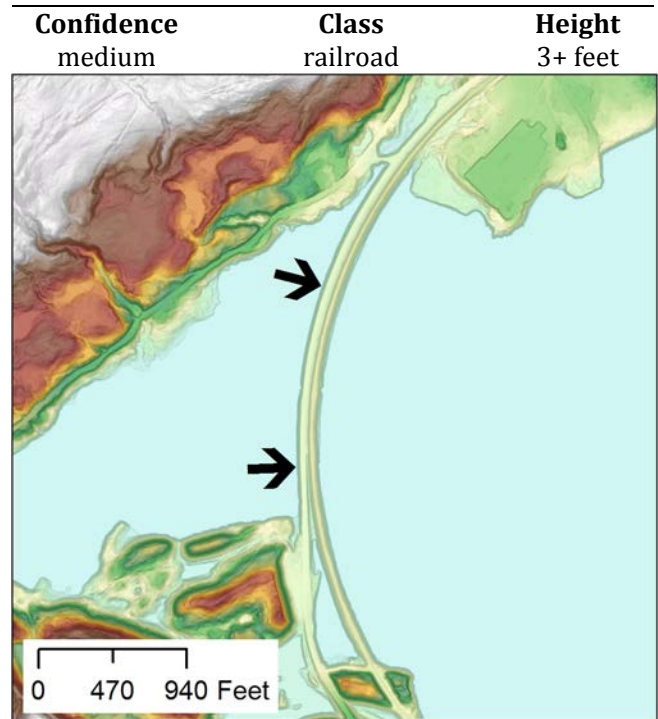
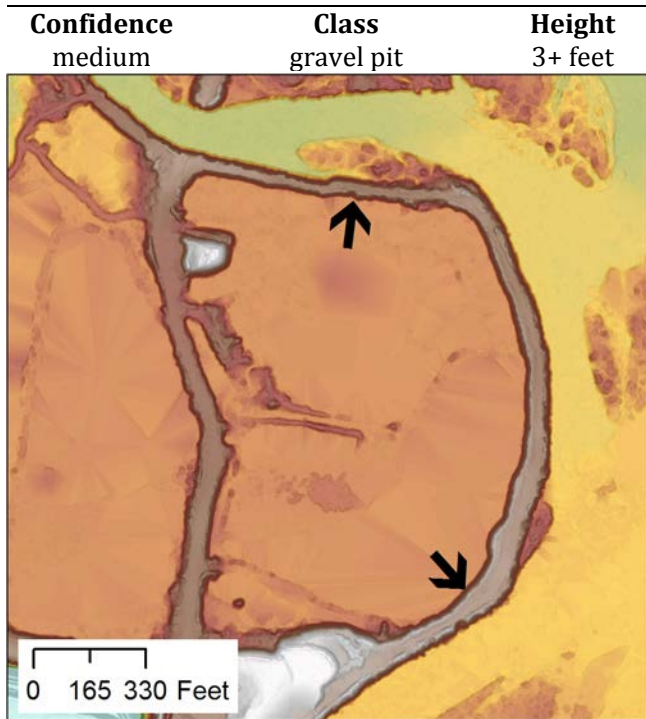
## 10.0 REFERENCES

- Mattison, L., 2011a, Estuarine levees inventory, OCMP, 2011: Portland, Ore., Oregon Department of Land Conservation, Oregon Coastal Management Program data release, scale 24,000, <http://www.coastalatlas.net/index.php>
- Mattison, L., 2011b, Estuarine levee protected lands, OCMP, 2011: Portland, Ore., Oregon Department of Land Conservation, Oregon Coastal Management Program data release. <http://www.coastalatlas.net/index.php>
- Mattison, L., 2011c, Current and historic estuarine diking, drainage or special districts, OCMP, 2011: Portland, Ore., Oregon Department of Land Conservation, Oregon Coastal Management Program data release, scale 24,000, <http://www.coastalatlas.net/index.php>
- Mattison, L., 2012, Lower Columbia River and estuary levees inventory, LCREP, 2012: Portland, Ore., Lower Columbia River Estuary Partnership data release, scale 10,000, <http://www.coastalatlas.net/index.php>
- U.S. Army Corps of Engineers, 2015, National levee database. <http://nld.usace.army.mil/egis/f?p=471:1:>

## 11.0 APPENDIX A: EXAMPLES OF LEVEE FEATURES

The examples below show geospatial features and associated attributes identified on the lidar DEM that were used or rejected in the DOGAMI 2017 levee inventory creation. Arrows indicate levee edge.





## 12.0 APPENDIX B: LEVEE INVENTORY ATTRIBUTES

Also see [Table 4-1](#), [Table 4-2](#), and [Table 4-3](#) for field descriptions. The values -7777 and -9999 are not included in domains shown below.

### Levee Lines Feature Class Attributes

LEVEE_ID
Applicable: All
Data Type: Text
<i>Example:</i> OCMF 2011_3617

SOURCE_CIT
Applicable: All
Data Type: Text
DOGAMI 2017
LCREP 2012
OCMP 2011
USACE 2015

JURISDICTI
Applicable: All
Data Type: Text
<i>Example:</i> Lane County

DGMI_CLASS
Applicable: DOGAMI 2017
USACE 2015
Data Type: Text
levee
levee (USACE)
dam
jetty
pond perimeter
railroad
road
berm
gravel pit perimeter

CLASS
Applicable: OCMF 2011
LCREP 2012
Data Type: Text
Breached Dike
Elevated Roadway
Historical/removed dike
man-made dike
Natural levee
Natural Levee with
man-made enhancements
rip rap
Sidecast of significance

CONFIDENCE
Applicable: DOGAMI 2017
USACE 2015
Data Type: Text
high
medium

PROT_ASSET
Applicable: DOGAMI 2017
USACE 2015
Data Type: Text
<i>Example:</i> agriculture, structures

HEIGHT
Applicable: All
Data Type: Double
<i>Example:</i> 3

SFHA
Applicable: DOGAMI 2017
USACE 2015
Data Type: Text
Protects from SFHA
Influences SFHA mapping
No protection/influence

COMMENTS
Applicable: All
Data Type: Text
<i>Example:</i> Once had a tidegate

HUC8_CODE
Applicable: All
Data Type: Text
<i>Example:</i> 17090003

HUC8_NAME
Applicable: All
Data Type: Text
<i>Example:</i> Upper Willamette

ADJ_WATER
Applicable: All
Data Type: Text
<i>Example:</i> Willamette River

SWCD
Applicable: All
Data Type: Text
<i>Example:</i> Tualatin SWCD

DISTRICT
Applicable: All
Data Type: Text
<i>Example:</i> John Drainage District

CONTACT
Applicable: LCREP 2012
Data Type: Text
<i>Example:</i> Name, email

MANAGER
Applicable: OCMF 2011
LCREP 2012
Data Type: Text
<i>Example:</i> Washington DOT

SOURCE
Applicable: All
Data Type: Text
<i>Example:</i> Lidar - Yambo 2010

DGMI_NLD
Applicable: USACE 2015
Data Type: Text
<i>Example:</i> USACE linework adjusted

NLD_LEV_ID
Applicable: USACE 2015
Data Type: Text
<i>Example:</i> 5001900611

NLD_SEG_ID
Applicable: USACE 2015
Data Type: Text
<i>Example:</i> 5004915801

BANK
Applicable: USACE 2015
Data Type: Text
Left Descending
Right Descending

ACCESS
Applicable: LCREP 2012
Data Type: Text
Complete
Partial

ACCESS_TYP
Applicable: LCREP 2012
Data Type: Text
<i>Example:</i> natural breach

**Levee Lines Attributes (continued)**

<b>VERIFICATI</b>
Applicable: LCREP 2012
Data Type: Text
Yes
No

<b>MATERIAL</b>
Applicable: USACE 2015 OCMP 2011 LCREP 2012
Data Type: Text
<i>Example:</i> Rip Rap and Fill

<b>DUAL_USE</b>
Applicable: OCMP 2011 LCREP 2012
Data Type: Text
Yes
No

<b>DUAL_DESCR</b>
Applicable: OCMP 2011 LCREP 2012
Data Type: Text
County Road
Private Road
Railroad
State Road

<b>PHYSICALIT</b>
Applicable: OCMP 2011
Data Type: Text
<i>Example:</i> Used to have a tidegate

<b>WATERSHED</b>
Applicable: OCMP 2011 LCREP 2012
Data Type: Text
<i>Example:</i> Skipanon watershed

<b>REF_ID_COD</b>
Applicable: All
Data Type: Text
mattL2011a
mattL2012
obriFE2017a
usace2015

**Protected Lands Feature Class Attributes**

<b>PROT_ID</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> OCMP 2011_11

<b>SOURCE_CIT</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> LCREP 2012

<b>TAXLOT</b>
Applicable: USACE 2015 DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> 1505250000100

<b>JURISDICTI</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> Benton County

<b>OWNER_TYPE</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> Private

<b>LAND_USES</b>
Applicable: DOGAMI 2017
Data Type: Text
<i>Example:</i> Exclusive Farm Use 20+

<b>NWI_CLASS</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> PFOC, R2UBH

<b>COMMENTS</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> ditched and culverted

<b>OCMP_WATER</b>
Applicable: OCMP 2011
Data Type: Text
<i>Example:</i> 18

<b>OCMP_SUBWA</b>
Applicable: OCMP 2011
Data Type: Text
<i>Example:</i> 3832

<b>REF_ID_COD</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> mattL2011a

## Special Districts Feature Class Attributes

<b>DISTRIC_ID</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text (free)
<i>Example:</i> OCMP 2011_11

<b>SOURCE_CIT</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text
<i>Example:</i> LCREP 2012

<b>NAME</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text (free)
<i>Example:</i> Trask Drainage District

<b>YEAR</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text (free)
<i>Example:</i> 1939

<b>STATUS</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text (domain)
Active district Inactive or disbanded district

<b>COUNTY</b>
Applicable: OCMP 2011
Data Type: Text (free)
<i>Example:</i> Coos

<b>CONTACT</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text (free)
<i>Example:</i> Name, phone number

<b>SOURCE</b>
Applicable: DOGAMI 2017
Data Type: Text (free)
<i>Example:</i> Lane County Clerk's Office

<b>NOTES</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text (free)
<i>Example:</i> Never formally dissolved

<b>ESTUARY</b>
Applicable: OCMP 2011
Data Type: Text (free)
<i>Example:</i> Tillamook

<b>REF_ID_COD</b>
Applicable: DOGAMI 2017 OCMP 2011
Data Type: Text (domain)
<i>Example:</i> mattL2011a

### 13.0 APPENDIX C: LEVEE INVENTORY SOURCE DATA DEFINITIONS

The reference for each feature in the levee inventory is provided below. The reference identification code can be found in the REF\_ID\_COD attribute field in each spatial layer.

Reference Identification Code	Original Map Scale	Reference
<i>Levee features</i>		
mattL2011a	1:24,000	Mattison, L., 2011a, Estuarine levees inventory, OCMP, 2011: Portland, Oreg., Oregon Department of Land Conservation, Oregon Coastal Management Program data release, scale 24,000, <a href="http://www.coastalatlas.net/index.php">http://www.coastalatlas.net/index.php</a>
mattL2012a	1:10,000	Mattison, L., 2012, Lower Columbia River and estuary levees inventory, LCREP, 2012: Portland, Oreg., Lower Columbia River Estuary Partnership data release, scale 10,000, <a href="http://www.coastalatlas.net/index.php">http://www.coastalatlas.net/index.php</a>
obriFE2017a	1:2,000	DOGAMI 2017, new data: levee lines
usace2015	1:2,000	U.S. Army Corps of Engineers, 2015, National levee database. <a href="http://nld.usace.army.mil/egis/f?p=471:1:">http://nld.usace.army.mil/egis/f?p=471:1:</a>
<i>Protected lands features</i>		
mattL2011b	1:24,000	Mattison, L., 2011b, Estuarine levee protected lands, OCMP, 2011: Portland, Oreg., Oregon Department of Land Conservation, Oregon Coastal Management Program data release. <a href="http://www.coastalatlas.net/index.php">http://www.coastalatlas.net/index.php</a>
obriFE2017b	1:2,000	DOGAMI 2017, new data: protected lands
<i>Special districts features</i>		
mattL2011c	1:24,000	Mattison, L., 2011c, Current and historic estuarine diking, drainage or special districts, OCMP, 2011: Portland, Oreg., Oregon Department of Land Conservation, Oregon Coastal Management Program data release, scale 24,000, <a href="http://www.coastalatlas.net/index.php">http://www.coastalatlas.net/index.php</a>
obriFE2017c	1:2,000	DOGAMI 2017, new data: special districts