US Army Corps of Engineers®
Portland District

WILLAMETTE VALLEY SYSTEM OPERATIONS AND MAINTENANCE

FINAL ENVIRONMENTAL IMPACT STATEMENT

APPENDIX S USACE-MANAGED DAMS, RESERVOIRS, AND BANK PROTECTION STRUCTURES

NEW APPENDIX ADDED TO THE FINAL EIS

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THIS APPENDIX HAS BEEN ADDED TO THE FEIS TO STREAMLINE INFORMATION IN EIS CHAPTER 1, INTRODUCTION

Summary of changes from the DEIS:

- **Details regarding USACE-managed facilities have been moved from DEIS Section 1.5, USACE-managed Dams and Reservoirs in the Willamette River Basin, to this appendix.**
- **New information and analyses regarding revetments and bank protection structures have been added to this appendix.**

1. INTRODUCTION

This appendix provides an overview of the Willamette Valley System (WVS) facilities. Dams and reservoirs are described in Section 2; revetements are detailed in Section 3; and a summary of dams, reservoirs, and other features (i.e., drop structures) by subbasin is provided in Section 4. Hydropower operations are described in detail in EIS Chapter 1, Section 1.10.2, Hydropower.

2. DAMS AND RESERVOIRS

Congress authorized USACE to construct, operate, and maintain the WVS for flood control purposes beginning in 1938. Subsequently, USACE constructed 13 dams and extensive bank protection revetments along the Willamette River and its tributaries, creating the WVS by the 1970s (Section 3, Revetments and Other Structures for Bank Protection). The WVS was originally authorized by the Flood Control Act of 1938, including authorization for the following dam construction projects:

Dam	Location
Fern Ridge Dam	Long Tom River
Dorena and Cottage Grove Dams	Coast Fork Willamette River Subbasin
Lookout Point Dam	Middle Fork Willamette River
Detroit Dam	North Santiam River

Subsequently, the following dams were also authorized under the Act:

Dam	Location
Big Cliff Dam	North Santiam River
Green Peter Dam	Middle Santiam River
Foster Dam	South Santiam River
Cougar and Blue River Dams	McKenzie River
Hills Creek and Dexter Dams	Middle Fork Willamette River
Fall Creek Dam	Fall Creek (tributary to the Middle Fork Willamette River)

All 13 dams are operated for multiple uses (EIS Chapter 1, Section 1.10, Congressionally Authorized Purposes). While the WVS is operated as one system, each dam and reservoir within the WVS is authorized for a specific set of purposes by Congress. Three are re-regulating dams (i.e., used to even out peak discharges of water utilized for power generation at an upstream dam, thereby controlling downstream river level fluctuations) (Table 2-1). Eight of the 13 dams are operated as hydropower dams (USACE 2019a).

A summary of each of the dams and reservoirs by subbasin is provided below (Section 4, Willamette Valley System Dam and Reservoir Descriptions by Subbasin).

Table 2-1. Willamette Valley System Dam Specifications.

Dam	Dam Length (feet)	Height (feet)	Elevation (feet NGVD)	Reservoir Length (miles)	Area When Full (acres)	No. of Generators	Total Output of Generators (MW)
Middle Fork Willamette Subbasin	–	–	–	–	–	–	–
Hills Creek	2,235	304	1,548	7.6	2,735	2	36
Lookout Point	3,381.5	276	941	14.2	4,360	3	146
Dexter	2,738	93	702.5	2.8	1,024.5	1	17
Fall Creek	5,100	205	839	6.8	1,820	0	N/A
Coast Fork Willamette Subbasin	–	–	–	–	–	–	–
Cottage Grove	1,750	95	808	3	1,156	0	N/A
Dorena	2,600	145	866	5	1,749	2[1]	7.2
McKenzie River Subbasin	–	–	–	–	–	–	–
Blue River	1,265	270	1,362	6.4	1,009	0	N/A
Cougar	1,600	452	1,700	6	1,280	2	30
Long Tom River Subbasin	–	–	–	–	–	–	–
Fern Ridge	6,330	44	379.5	4.5	9,000	0	N/A
South Santiam River Subbasin	–	–	–	–	–	–	–
Green Peter	1,500	327	941	10	3,720	2	98
Foster	4,565	126	702.5	3.5	1,220	2	24
North Santiam River Subbasin	–	–	–	–	–	–	–
Detroit	1,523.5	463	1,580	9	3,500	2	127.8
Big Cliff	280	191	1,212	2.8	N/A	1	23

Source: USACE 2020

[1] USACE does not operate Dorena for hydropower. In 2012, a privately owned and operated hydropower facility (Dorena Hydro Power) was added and is operated under a FERC license.

NGVD = National Geodetic Vertical Datum; MW = megawatt; N/A = Not Applicable

This system of dams was shown to prevent about $1.5 billion annually in flood damages in the Willamette Valley as of December 2022 (USACE 2022). Urbanization of the floodplain has continued—partially due to the reduction and management of flooding in the Willamette River Basin resulting from the WVS. Since the construction of the WVS, the population in the analysis area has continued to grow substantially (USACE 2019b).

3. REVETMENTS AND OTHER STRUCTURES FOR BANK PROTECTION

3.1 Bank Protection Projects and Regulatory History

USACE, Portland District, manages and maintains bank protection structures (i.e., revetments) along the mainstem of the Willamette River and the following tributaries: Row, Calapooia, Coast Fork and Middle Fork Willamette, McKenzie, South Santiam, North Santiam, Santiam, Molalla, and Clackamas Rivers and Mill Creek. Portland District has the responsibility of administering the Willamette River Bank Protection Program. The Program consists of 223 Federally constructed projects authorized under the Flood Control Acts (1936, 1938, 1950) for flood control and erosion prevention.

Bank protection projects were constructed along the Willamette River and its major tributaries. The projects cleared, sloped, and reveted riverbanks; constructed pile and timber bulkheads and drift barriers; and conducted minor channel improvements and maintenance of existing construction. Bank projection projects are composed of one or more structures and include additional structures associated with emergency repairs. Thirty-four additional bank protection or river training structures were also constructed under various other authorizations such as the River and Harbors Act and Mitigation and Emergency Bank Protection authorities for navigation or emergency bank protection purposes. These structures are not active in the Willamette River Bank Protection Program.

There are 193 active bank protection projects in the Willamette River Bank Protection Program, categorized as either USACE-maintained or non-USACE-maintained. Of these, 88 were constructed prior to 1953 under the Flood Control Acts of 1936 and 1938 and are USACE-maintained (Figure 3-1). The Federal Government is responsible for providing funding to support inspection, monitoring, and maintenance activities for these 88 projects. The remaining 105 projects, constructed post-1953 and authorized under the 1950 Flood Control Act, are sponsored, operated, and maintained by local sponsors.

3.2 Revetment Structures and Purpose

Revetments are structures placed on riverbanks with the purpose of absorbing the energy of flowing water and reducing erosion of bank materials. Types of revetment structures that were constructed by USACE in association with the Willamette River Bank Protection Program include: riprap (loose, large stone placed directly on the slope), drift barriers (timber or steel pile structures parallel to the bank designed to reduce the velocity of overbank flow and to trap debris), and stone groins (structures perpendicular to the bank that extend into the river and are designed to deflect flow from the bank). A typical design of a riprap revetment involves creating a facing surface for stone that is even with the existing ground surface (Figure 3-2).

Some revetments are associated with channel plugs and embankments, and a few are associated with embankments that are recorded as levees in the National Levee Database. Plugs are short earthen structures that close off a side channel from the main channel but are typically the same elevation as the floodplain. Even though they reduce the potential of flows entering the side channels, they are relatively low in elevation and do not prevent water from entering the larger floodplain.

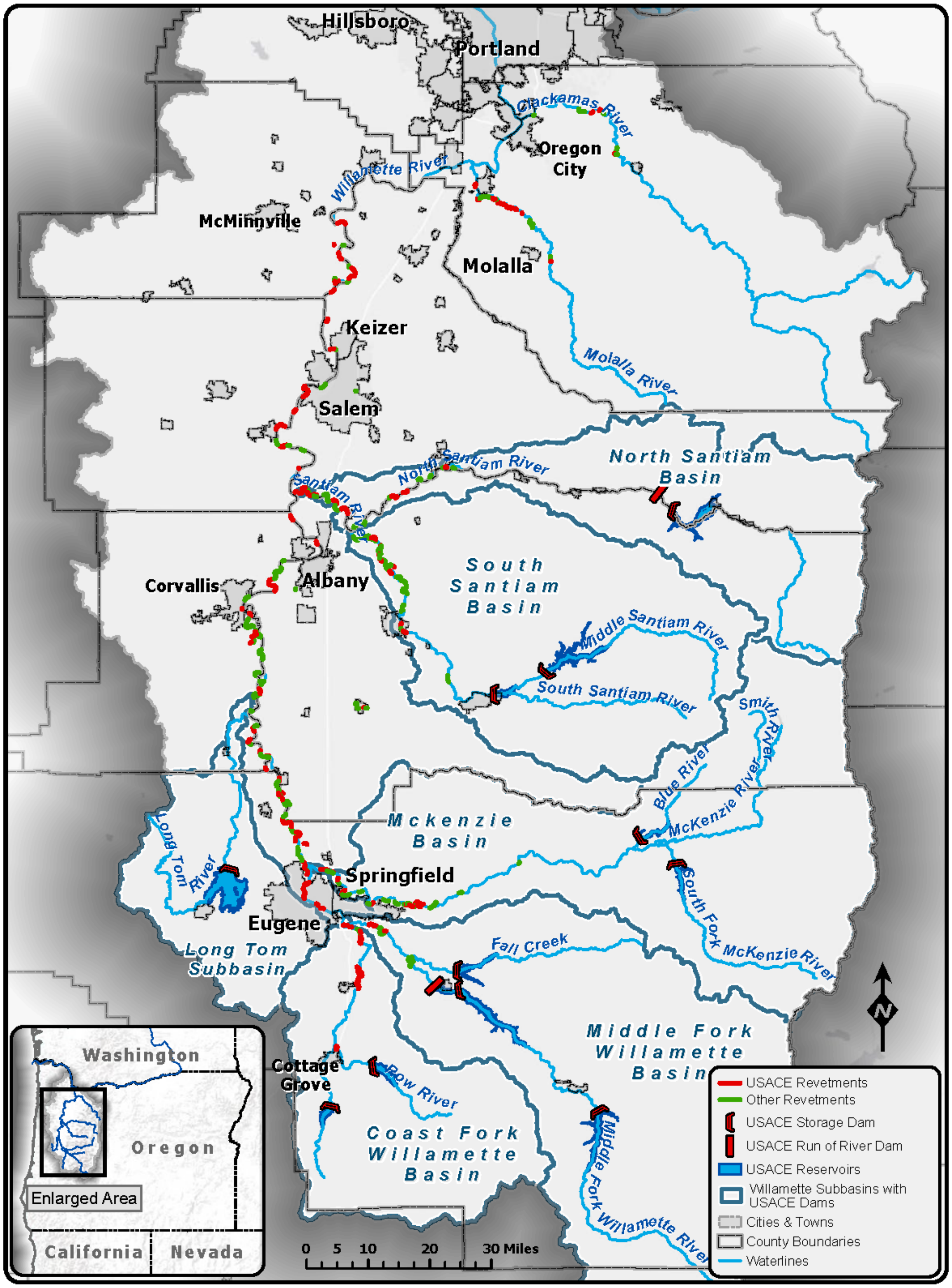

Figure 3-1. Locations of Willamette River Basin Bank Protection Projects*.

*Due to unknown locations of non-USACE-constructed revetments in the Willamette River Basin, the figure only depicts USACE-constructed revetments.

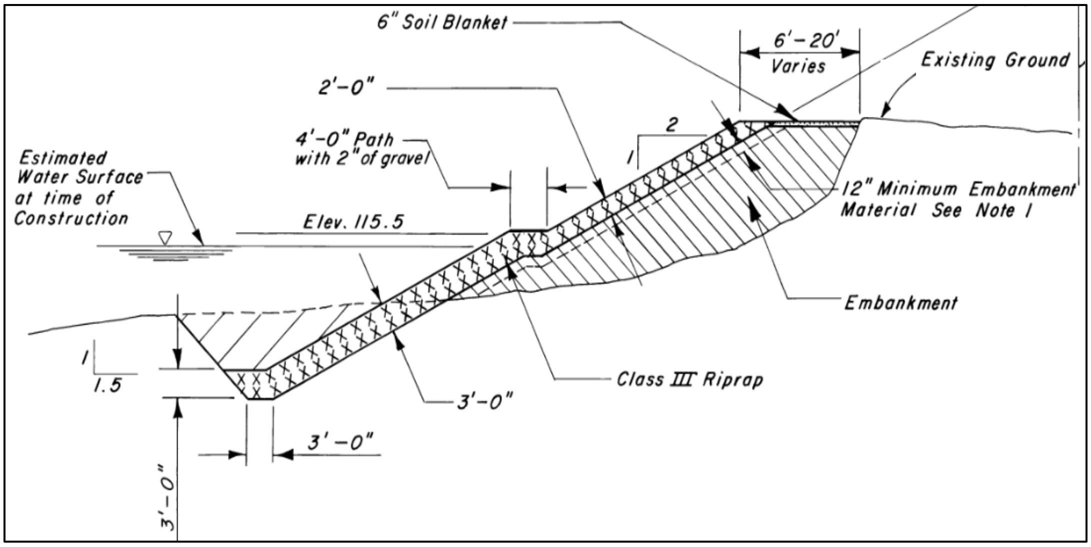

Figure 3-2. Typical Cross Section of a Riprap Revetment.
Source: Drawing Number WR 85-40/4 (USACE 1985)

Embankments are earthen structures that are taller than the floodplain and parallel the river. Typically, embankments are connected to high ground on one end to provide a continuous facing to extend the length of the revetment (Figure 3-3). Water can enter the floodplain upstream or downstream of most embankments. The embankment is higher than the existing ground line and provides a facing surface for the riprap.

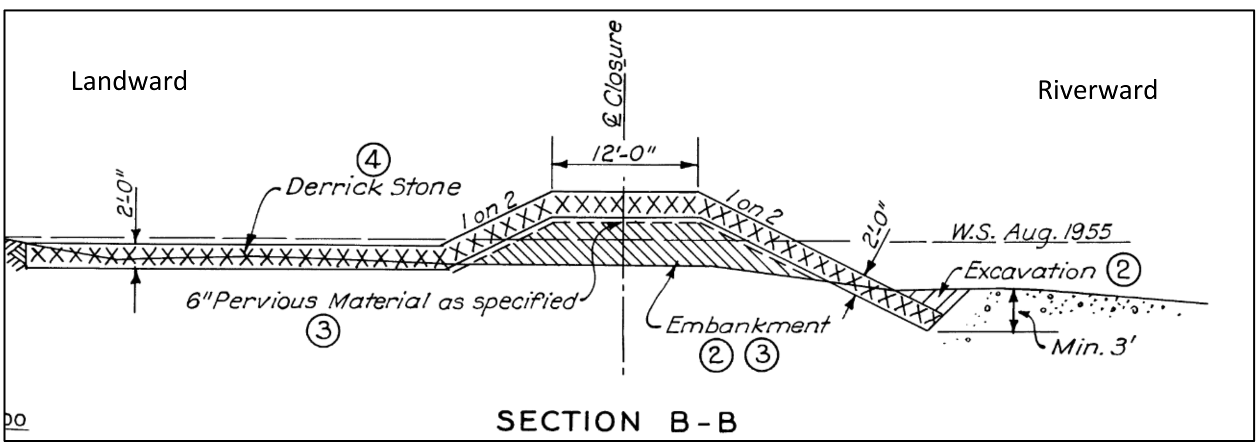

Figure 3-3. Typical Cross Section of a Riprap Revetment Associated with an Embankment.
Source: Drawing Number MF-1-15/2 (USACE 1955)

Levees are embankments that tie into high ground on both sides and form a leveed surface, which is an area of differential hydraulic head where the ponded surface in the main channel is above the elevation of the floodplain during periods of high flow. There are no revetments within the Willamette River Bank Protection Program that are associated with intact levees.

3.3 Inundation Analysis

An inundation analysis of the USACE-maintained revetments concluded that for the 50 percent annual exceedance probability flood event (i.e., a flood event that has a 50 percent chance of occurring each year), revetment failure would not lead to inundation of the floodplain for most of the 61 revetment projects that were studied (Table 3-1) (USACE 2013). This conclusion was either because the land surface was higher in elevation than the 50 percent annual exceedance probability flood stage (24 revetment projects, 39 percent of the 61 revetment projects studied), or the revetments and floodplain were overtopped by the 50 percent annual exceedance probability event (12 revetment projects, 20 percent of the 61 revetment projects studied).

Table 3-1. Inundation Categorization Based on Four Revetment Classes for Projects on the Mainstem Willamette River and Willamette River Tributaries.

Revetment Class	Number in Mainstem Willamette	Mainstem Willamette Percent of Total	Number in Willamette Tributaries	Willamette Tributary Percent of Total
1. Revetment armors high land surface	17	40	7	37
2. Revetment armors low land surface	11	26	1	5
3. Revetment limits floodwater access to simple floodplain	4	10	6	32
4. Revetment limits floodwater access to complex floodplain	10	24	5	26

Source: USACE 2013

3.4 Revetment Descriptions

The Affected Environment for revetments includes the 88 USACE-maintained flood damage reduction projects within the WVS that are active in the Willamette River Bank Protection Program and area of inundation (floodplains or connected side channels) that would be in contact with water from the mainstem of a river if the revetment was not present (Figure 3-1). The term “structure” as used in the following descriptions of existing conditions is synonymous with revetment, drift barrier, groin, plug, or embankment.

Structures within the Clackamas River Subbasin and the Molalla-Pudding Rivers Subbasin are described below because they are under USACE responsibility in the Willamette River Basin (FEIS Section 1.4.1, Geographic Scope). Although not within the WVS for flood control, these structures are associated with flood damage reduction projects and are included for a cumulative assessment of effects on aquatic resources.

3.4.1 Coast Fork Willamette River Subbasin

USACE constructed 35 structures in the Coast Fork Willamette River Subbasin (Figure 3-4). There are approximately 35,000 linear feet of structures under USACE responsibility in the Coast Fork Willamette River Subbasin (Table 3-2).

USACE has operations and maintenance responsibility for 32 of these structures, 2 structures have been turned over to sponsors, and 1 structure was constructed under emergency authorization and does not have a sponsor (Table 3-3). Seventeen of the USACE structures are not active in the Willamette River Bank Protection Program but are part of the Dorena Reservoir Project and, therefore, are under USACE operations and maintenance responsibility.

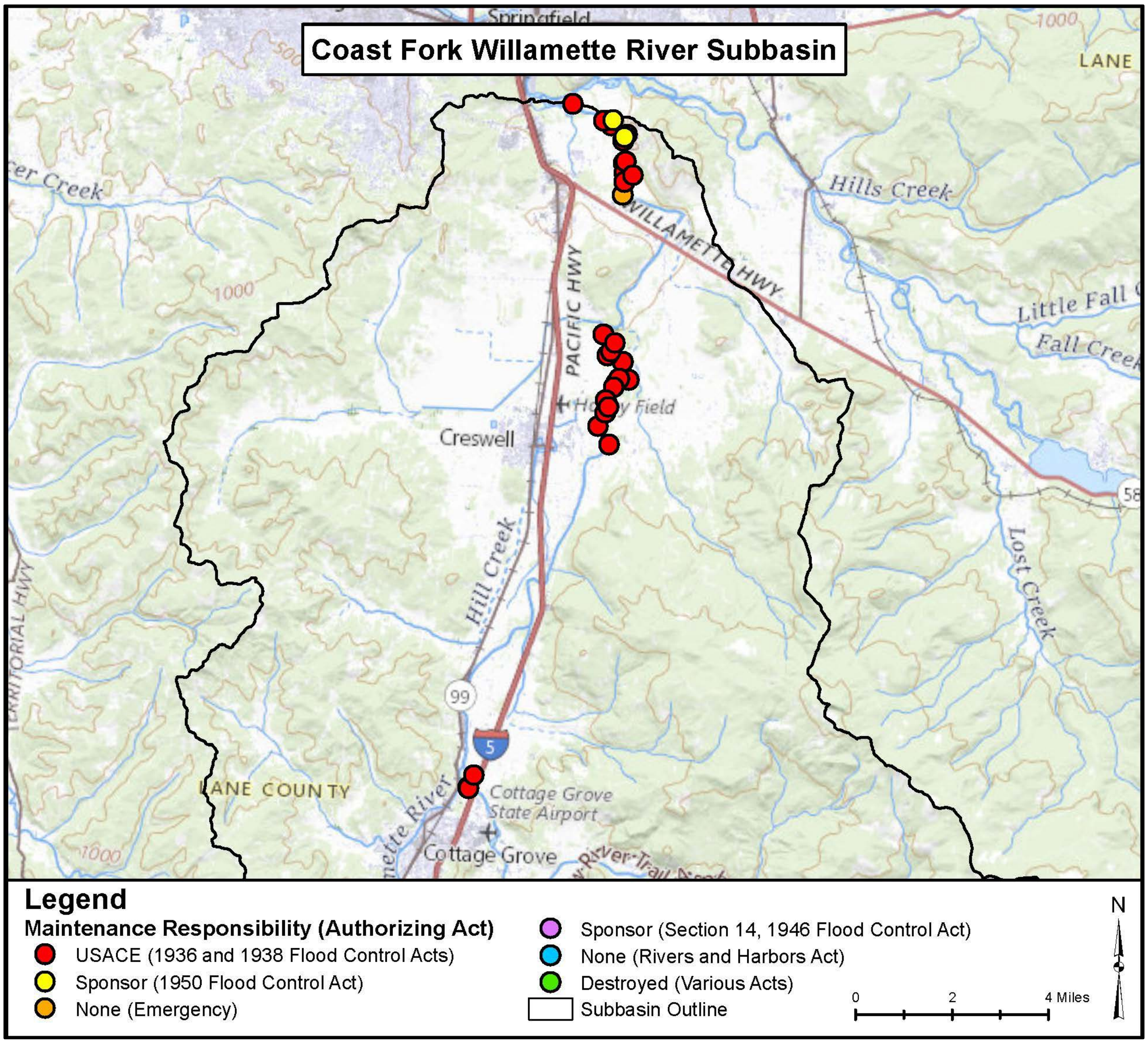

Figure 3-4. Structure Centerpoint Location for USACE-maintained Coast Fork Willamette River Subbasin Revetments.

Table 3-2. Length of Coast Fork Willamette River Subbasin Revetment Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin	Drift Barrier	Embankment (linear feet)	Plug (linear feet)
USACE	Flood Control Acts of 1936 and 1938	25,537	-	-	9,074	287
Sponsor	Flood Control Act of 1950	1,944	-	-	-	-
None	Emergency	1,579	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	-	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Table 3-3. Number of Coast Fork Willamette River Subbasin Revetment Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	21	-	-	8	3
Sponsor	Flood Control Act of 1950	2	-	-	-	-
None	Emergency	1	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	-	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

In the 2013 revetment consequence analysis report, two HEC-RAS models were created for USACE-maintained revetment projects on the tributaries of the Willamette River (USACE 2013). One model was developed to represent inundation due to the 50 percent annual exceedance probability flood event with the revetments in place and the other model was developed to estimate inundation due to the 50 percent annual exceedance probability flood event for the condition where the revetment project was removed.

Inundation from the “removed” model minus inundation from the “in place” model is additional inundation that would reach the floodplain under the 50 percent annual exceedance probability flood event if the revetment were not in place (Table 3-4). Additional inundation for the 11 revetment projects that were modeled in the Coast Fork Willamette Subbasin is summarized in Table 3-4. Five of the 11 revetment projects reduce the ability of the 50 percent annual exceedance probability flood event to inundate the floodplain.

Table 3-4. Additional Inundation in the Coast Fork Willamette River Subbasin due to USACE-maintained Revetments.

Revetment Name	Additional Inundation Acreage at 50 Percent Annual Exceedance Probability
Dorena Reservoir—Hemenway	16.1
Dorena Reservoir—Benter	2.5
Dorena Reservoir—Haskin-Lower	10.3
Dorena Reservoir—Rinehart	0
Dorena Reservoir—Seavey Bridge	0
Dorena Reservoir—Sly-Lower	0
Dorena Reservoir—Sly-Upper	7.9
Evans	36.4
McCully Left Bank	0
McCully Left Bank—Upstream	0
McCully Right Bank	0

Source: USACE 2013

3.4.2 Long Tom River Subbasin

No revetments associated with the Willamette River Bank Protection Program are present in the Long Tom River Subbasin. Based on as-built drawings, revetments are associated with USACE construction of the Long Tom River channel, but information on the location and extent of the revetments is not available (USACE 1958).

3.4.3 McKenzie River Subbasin

USACE constructed 27 structures in the McKenzie River Subbasin (Figure 3-5). Approximately 51,000 linear feet of structures are under USACE responsibility in the McKenzie River Subbasin (Table 3-5).

USACE has operations and maintenance responsibility for 8 of these structures, 15 structures have been conveyed to sponsors, and 1 structure was constructed under emergency authorization and does not have a sponsor (Table 3-6). Three of the revetments have been destroyed.

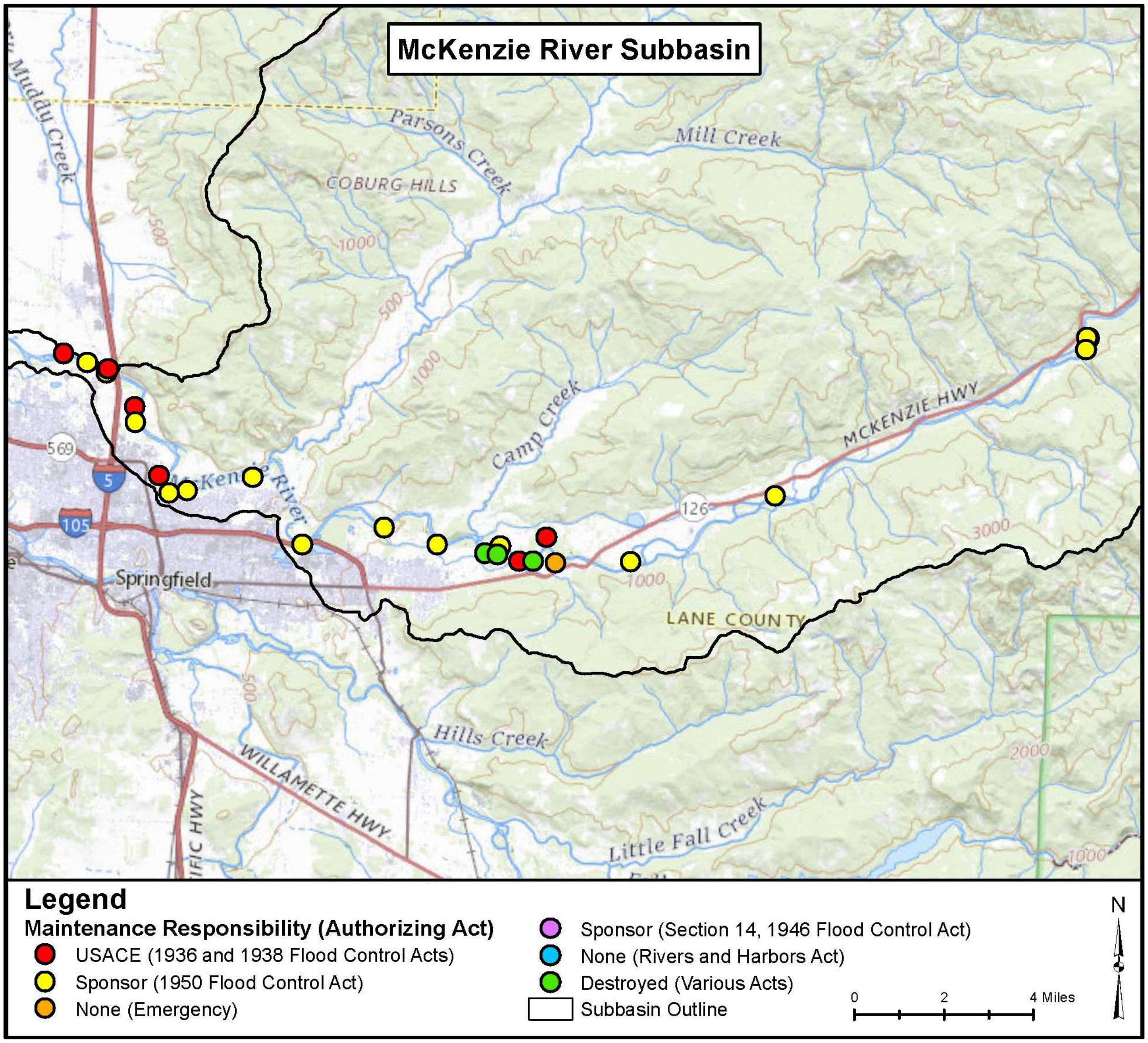

Figure 3-5. Structure Centerpoint Location and Operations and Maintenance Responsibility of McKenzie River Subbasin Revetments.

Table 3-5. Length of McKenzie River Subbasin Revetment Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin (linear feet)	Drift Barrier	Embankment (linear feet)	Plug
USACE	Flood Control Acts of 1936 and 1938	48,563	-	-	2,176	-
Sponsor	Flood Control Act of 1950	53,843	1,481	-	-	-
None	Emergency	52,420	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	1,971	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Table 3-6. Number of McKenzie River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	7	-	-	1	-
Sponsor	Flood Control Act of 1950	13	2	-	-	-
None	Emergency	1	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	3	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

In the 2013 revetment consequence analysis report, two HEC-RAS models were created for USACE-maintained revetment projects on the tributaries of the Willamette River (USACE 2013). One model was developed to represent inundation due to the 50 percent annual exceedance probability flood event with the revetments in place and the other model was developed to estimate inundation due to the 50 percent annual exceedance probability flood event for the condition where the revetment project was removed.

The inundation from the "removed" model minus inundation from the "in place" model is additional inundation that would reach the floodplain under the 50 percent annual exceedance probability flood event if the revetment were not in place (Table 3-7). All but one of the projects do not prevent additional inundation of the floodplain due to a 50 percent annual exceedance probability flood event.

Table 3-7. Additional Inundation in the McKenzie River Subbasin due to USACE-maintained Revetments.

Revetment Name	Additional Inundation Acreage at 50 Percent Annual Exceedance Probability
Armitage	0
Blankton	0
Coburg Bridge	0
Conley Place	0
Hart Embankment	62
Myers-Eyler	0

Source: USACE 2013

3.4.4 Middle Fork Willamette River Subbasin

USACE constructed 19 structures in the Middle Fort Willamette River Subbasin (Figure 3-6). There are over 24,000 linear feet of structures under USACE responsibility in the Middle Fork Willamette River Subbasin (Table 3-8).

USACE has operations and maintenance responsibility for 12 of these structures and 7 structures have been conveyed to sponsors (Table 3-9). The A. C. Clearwater project was constructed with a levee and is listed as a levee in the National Levee Database, but the levee has breached and no longer provides flood damage reduction (USACE 2023). The embankments associated with the Fisher Location RT and LT Bank locations are listed as levees in the National Levee Database, but they do not tie into high ground. The Fisher Location projects were not studied as part of the 2013 consequence assessment because USACE does not have operations and maintenance responsibility for these projects.

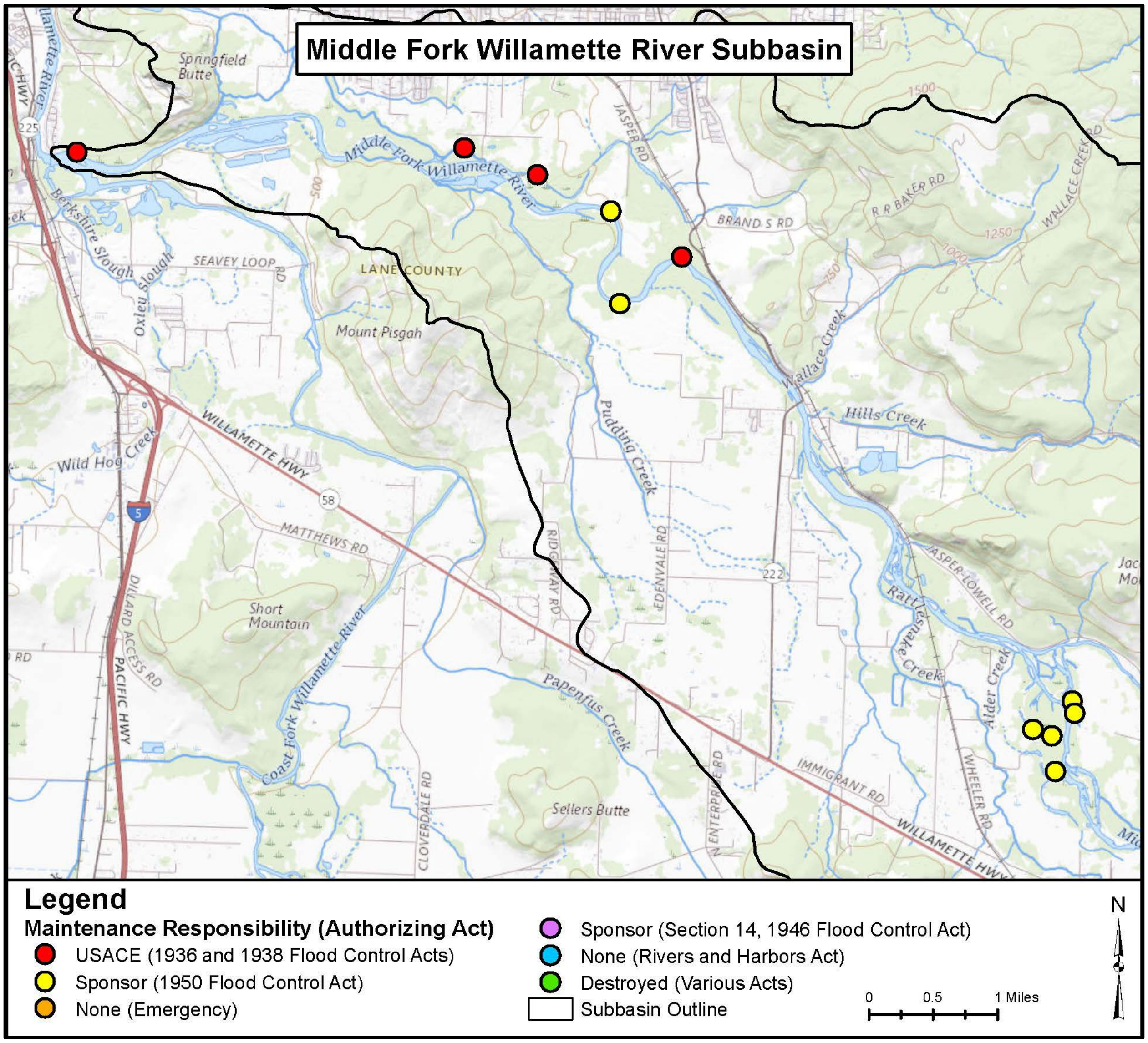

Figure 3-6. Structure Centerpoint Location and Operations and Maintenance Responsibility of Middle Fork Willamette River Subbasin Revetments.

Table 3-8. Length of Middle Fork Willamette River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin	Drift Barrier (linear feet)	Embankment (linear feet)	Plug
USACE	Flood Control Acts of 1936 and 1938	21,104	-	-	3,473	-
Sponsor	Flood Control Act of 1950	8,784	-	-	1,485	-
None	Emergency	-	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	-	-	249	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Table 3-9. Number of Middle Fork Willamette River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	8	-	-	4	-
Sponsor	Flood Control Act of 1950	5	-	-	2	-
None	Emergency	-	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	-	-	1	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

In the 2013 revetment consequence analysis report, two HEC-RAS models were created for USACE-maintained revetment projects on the tributaries of the Willamette River (USACE 2013). One model was developed to represent inundation due to the 50 percent annual exceedance probability flood event with the revetments in place and the other model was developed to estimate inundation due to the 50 percent annual exceedance probability flood event for the condition where the revetment project was removed.

The inundation from the "removed" model minus inundation from the "in place" model is additional inundation that would reach the floodplain under the 50 percent annual exceedance probability flood event if the revetment were not in place (Table 3-10). Revetments on the Middle Fork Willamette River Subbasin do not prevent inundation of the floodplain due to the 50 percent annual exceedance probability flood event.

Table 3-10. Additional Inundation due to USACE-maintained Revetments.

Revetment Name	Additional Inundation Acreage at 50 Percent Annual Exceedance Probability
A. C. Clearwater	0
Dorris-Leonard	0

Source: USACE 2013

3.4.5 Middle Mainstem Willamette River Subbasin

USACE constructed 40 structures in the Middle Mainstem Willamette River Subbasin (Figure 3-7). Approximately 79,000 linear feet of structures are under USACE responsibility in the Middle Mainstem Willamette River Subbasin (Table 3-11).

USACE has operations and maintenance responsibility for 23 of the 40 structures. Eleven structures have been conveyed to sponsors, 3 were constructed under authority of the Rivers and Harbors Act (neither USACE nor sponsors have operations and maintenance responsibility), 2 structures were constructed under emergency authorization and do not have a sponsor, and 1 structure was constructed under Section 14 of the 1946 Flood Control Act and has been conveyed to a sponsor (Table 3-12). Two of the revetments have been destroyed.

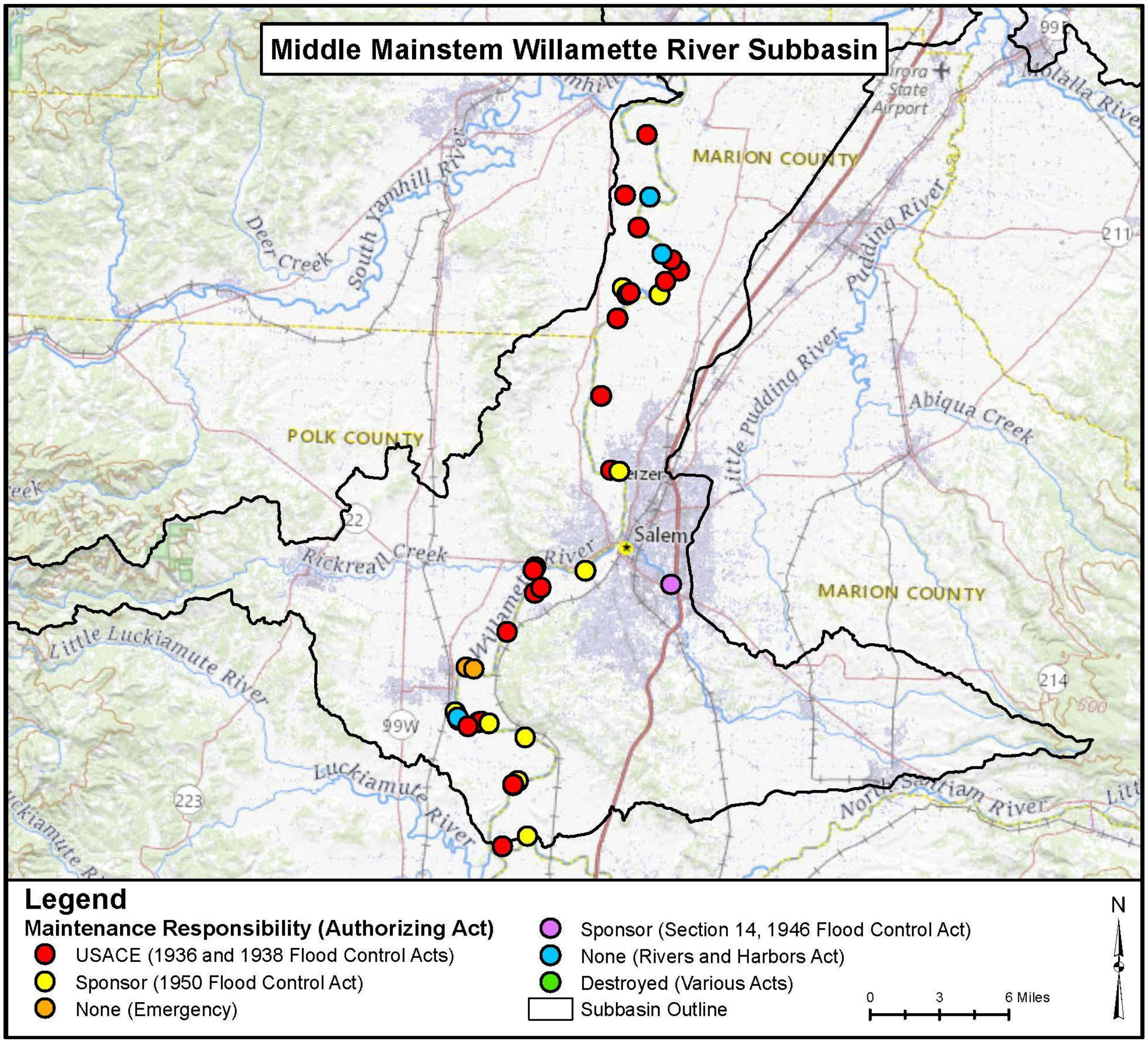

Figure 3-7. Structure Centerpoint Location and Operations and Maintenance Responsibility of Middle Mainstem Willamette River Subbasin Revetments.

Table 3-11. Length of Middle Mainstem Willamette River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin	Drift Barrier (linear feet)	Embankment	Plug (linear feet)
USACE	Flood Control Acts of 1936 and 1938	76,971	-	1,721	-	631
Sponsor	Flood Control Act of 1950	63,514	-	2,438	-	-
None	Emergency	7,089	-	1,749	-	-
None	Rivers and Harbors Act	28,828	-	-	-	-
Destroyed	Various Acts	-	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	410	-	-	-	-

Table 3-12. Number of Middle Mainstem Willamette River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	21	-	1	-	1
Sponsor	Flood Control Act of 1950	9	-	2	-	-
None	Emergency	1	-	1	-	-
None	Rivers and Harbors Act	3	-	-	-	-
Destroyed	Various Acts	-	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	1	-	-	-	-

Floodplain inundation mapping was conducted for the Mainstem Willamette River instead of HEC-RAS modeling during the 2013 consequence analysis; 16 revetment projects were assessed (USACE 2013). Four of the projects did not have inundation associated with the 50 percent annual exceedance probability event because the floodplain was above the flood elevation, 6 of the revetment structures were overtopped by the 50 percent annual exceedance probability flood stage, and 6 provided some flood damage reduction for a 50 percent probability event (Table 3-13).

Table 3-13. Results of Inundation Mapping for USACE-maintained Revetments in the Mainstem Willamette River.

Revetment Name	50 Percent Annual Exceedance Probability Inundation Area (acres)	Overtopped by 50 Percent Annual Exceedance Event
Bechtold	1,610.70	Yes
Budds Chute	3,571.90	No
Catlin	3,437.30	No
Ditmars Bend D/S	127.3	No
Ditmars Bend U/S	309.9	No
Eola Bend D/S	-	N/A
Eola Bend U/S	-	Yes
Grand Island	2,884.40	No
Gray Eagle Bar	1,757.80	Yes
Keizer Rapids	-	N/A
Murphy's Bar U/S	2,344.80	Yes
Probst	1,163.60	No
Stoutenberg	2,030.00	Yes
Weston Bend	1,125.00	Yes
Wheatland Dam Loc A	-	N/A
Wheatland Dam Loc B	2,959.70	Yes

Source: USACE 2013
N/A = Not Applicable

3.4.6 North Santiam River Subbasin

USACE constructed 24 structures in the North Santiam River Subbasin (Figure 3-8). Approximately 29,000 linear feet of structures are under USACE responsibility in the North Santiam River Subbasin (Table 3-14).

USACE has operations and maintenance responsibility for 7 structures, and 17 structures have been conveyed to sponsors (Table 3-15).

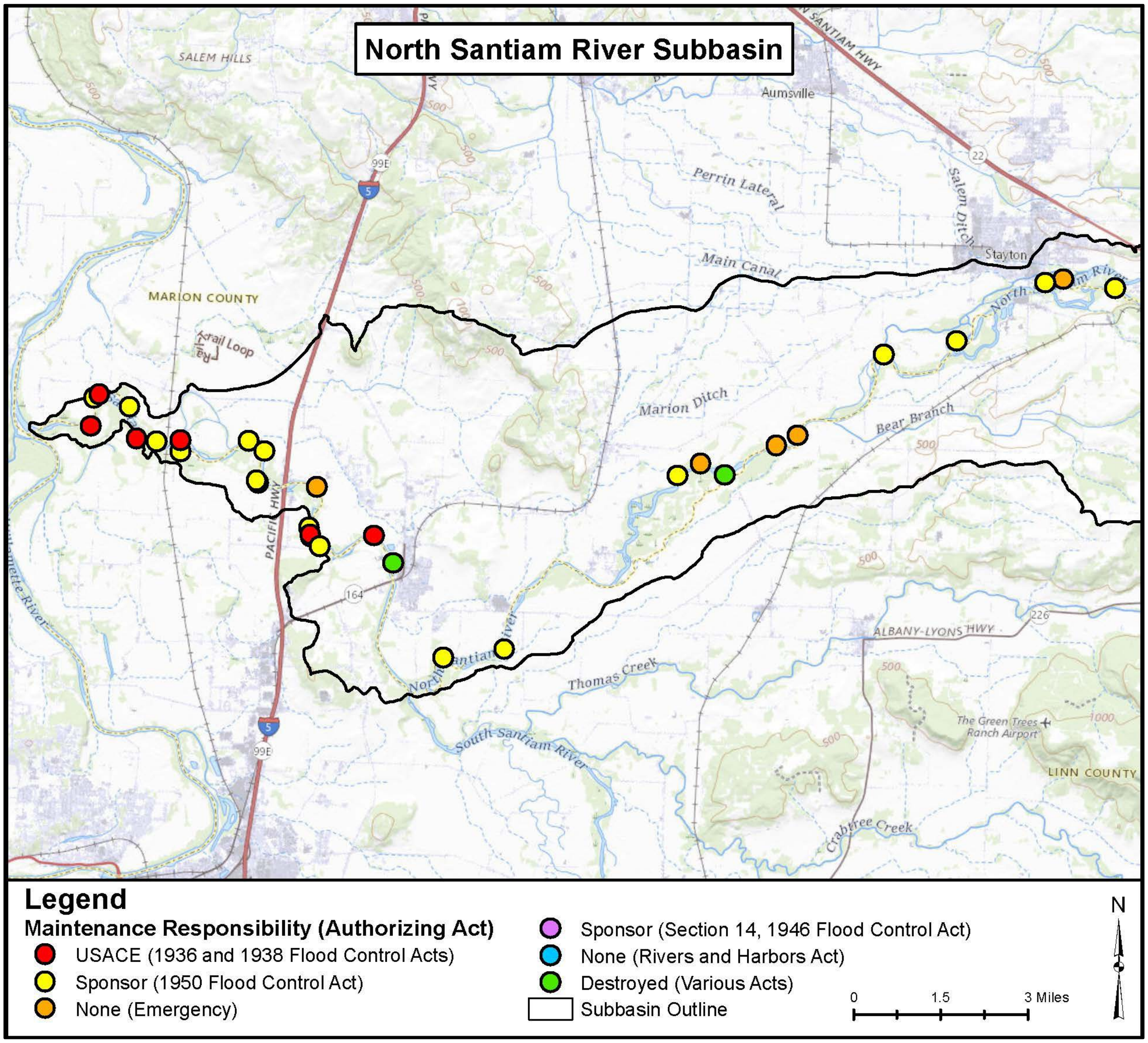

Figure 3-8. Structure Centerpoint Location and Operations and Maintenance Responsibility of North Santiam River Subbasin Revetments.

Table 3-14. Length of North Santiam River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin	Drift Barrier (linear feet)	Embankment (linear feet)	Plug
USACE	Flood Control Acts of 1936 and 1938	27,179	-	1,088	808	-
Sponsor	Flood Control Act of 1950	40,340	-	1,960	-	-
None	Emergency	-	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	-	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Table 3-15. Number of North Santiam River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	5	-	1	1	-
Sponsor	Flood Control Act of 1950	15	-	2	-	-
None	Emergency	-	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	-	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

None of the North Santiam Subbasin revetment projects were analyzed for additional inundation during the 2013 consequence assessment (USACE 2013).

3.4.7 South Santiam River Subbasin

USACE constructed 44 structures in the South Santiam River Subbasin (Figure 3-9). Approximately 16,000 linear feet of structures are under USACE responsibility in the South Santiam River Subbasin (Table 3-16).

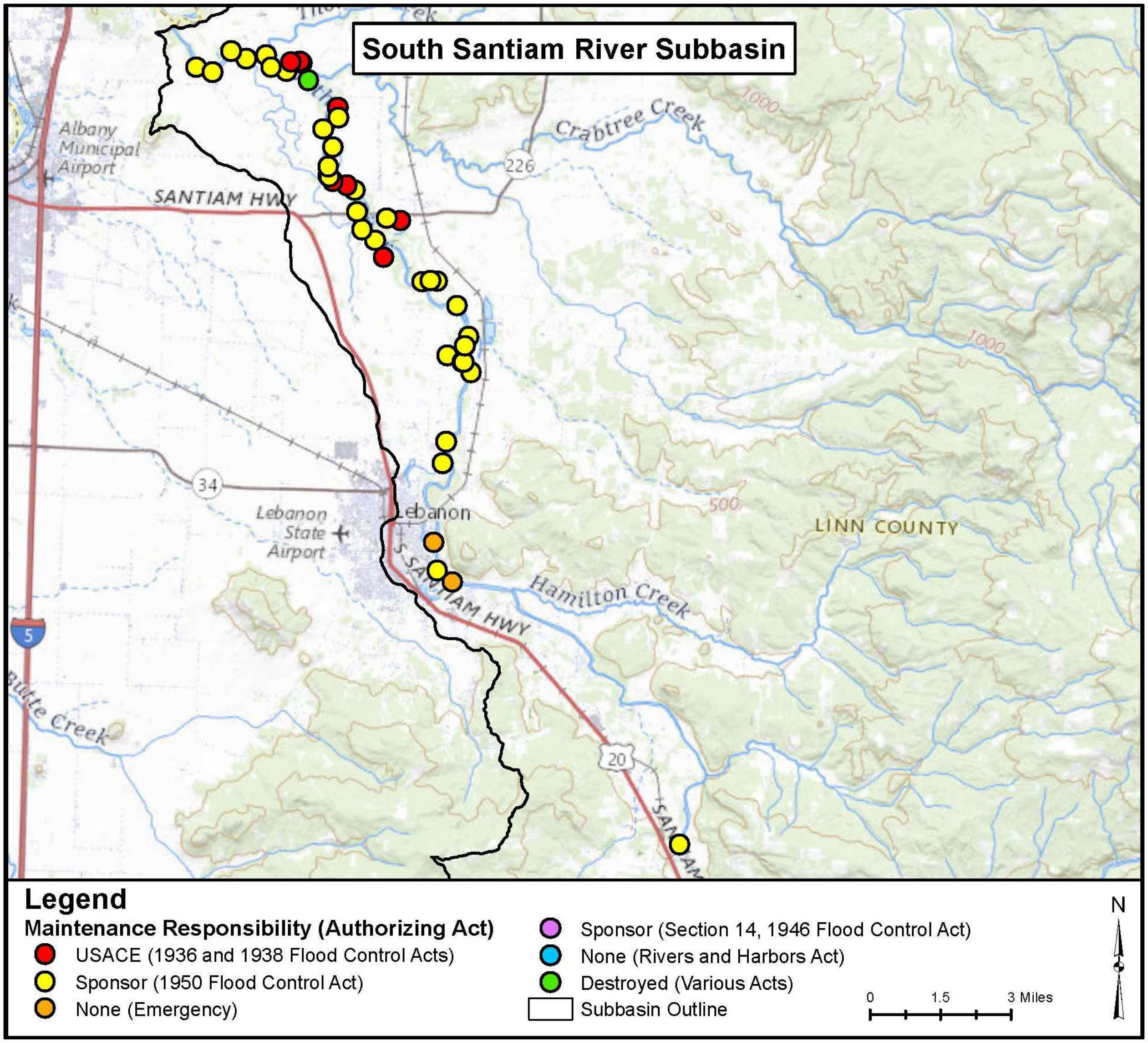

Figure 3-9. Structure Centerpoint Location and Operations and Maintenance Responsibility of South Santiam River Subbasin Revetment.

Table 3-16. Length of South Santiam River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin (linear feet)	Drift Barrier (linear feet)	Embankment (linear feet)	Plug
USACE	Flood Control Acts of 1936 and 1938	13,578		2,072	945	-
Sponsor	Flood Control Act of 1950	54,290	435	2,984	-	-
None	Emergency	4,186	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	1,250	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

USACE has operations and maintenance responsibility for 9 of these structures, 32 structures have been conveyed to sponsors, and 2 structures were constructed under emergency authorization and do not have a sponsor (Table 3-17). One of the revetments has been destroyed.

Table 3-17. Number of South Santiam River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	6	-	2	1	-
Sponsor	Flood Control Act of 1950	27	1	4	-	-
None	Emergency	2	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	1	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

None of the South Santiam River Subbasin revetment projects were analyzed for additional inundation during the 2013 consequence assessment (USACE 2013).

3.4.8 Upper Mainstem Willamette River Subbasin

USACE constructed 97 structures in the Upper Mainstem Willamette River Subbasin (Figure 3-10). Approximately 184,000 linear feet of structures are under USACE responsibility in the Upper Mainstem Willamette River Subbasin (Table 3-18).

USACE has operations and maintenance responsibility for 38 of these structures, 45 structures have been conveyed to sponsors, 8 structures were constructed under emergency authorization, and 4 structures were authorized by the Rivers and Harbors Act and do not have a sponsor (Table 3-19). Two of the revetments have been destroyed.

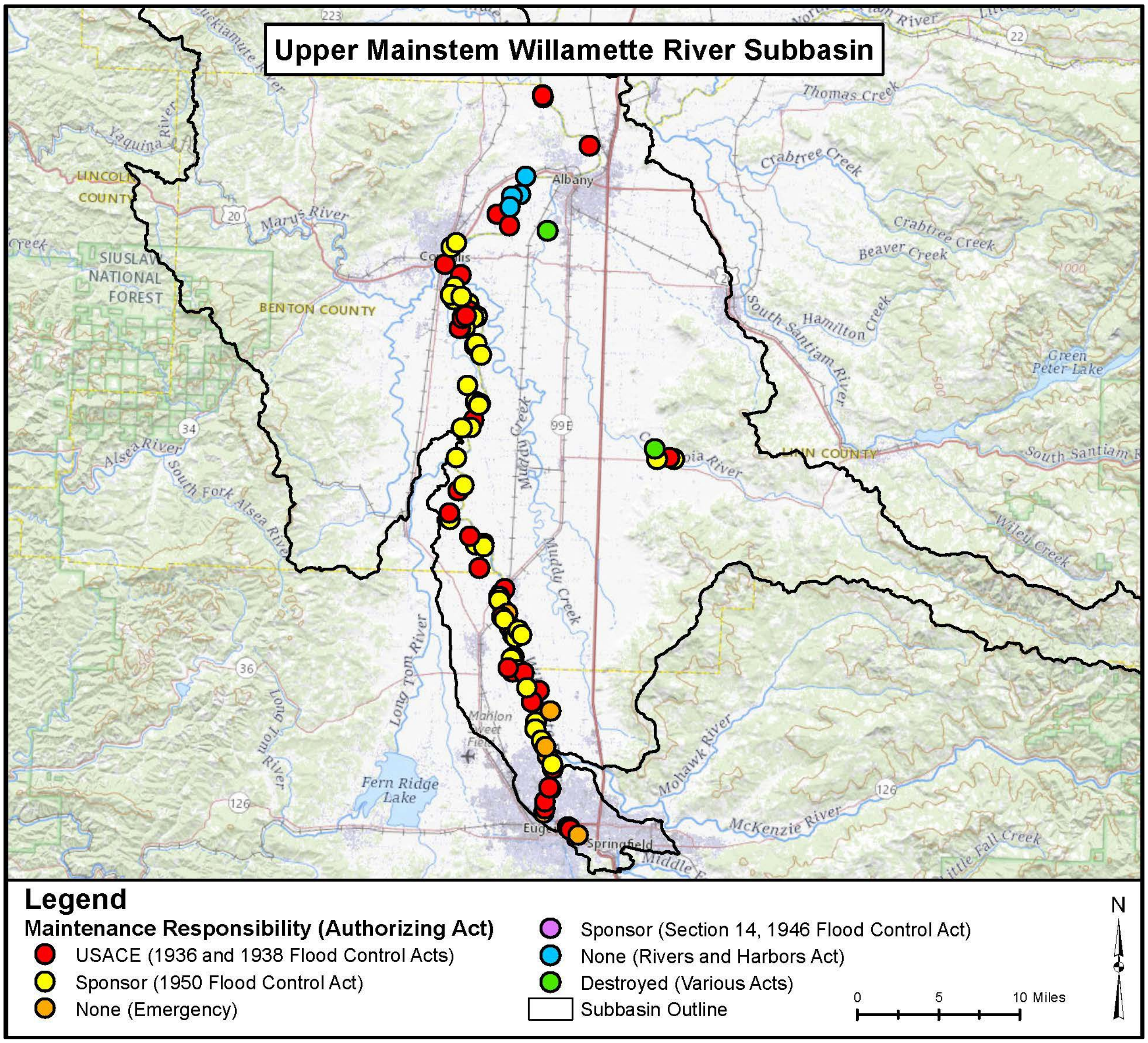

Figure 3-10. Structure Centerpoint Location and Operations and Maintenance Responsibility of Upper Mainstem Willamette River Subbasin Revetments.

Table 3-18. Length of Upper Mainstem Willamette River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin (linear feet)	Drift Barrier (linear feet)	Embankment (linear feet)	Plug (linear feet)
USACE	Flood Control Acts of 1936 and 1938	167,342		12,723	1,881	2,173
Sponsor	Flood Control Act of 1950	164,622	884	4,380	-	-
None	Emergency	182,310	-	-	-	-
None	Rivers and Harbors Act	148,023	-	-	-	-
Destroyed	Various Acts	2,583	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Table 3-19. Number of Upper Mainstem Willamette River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	32		3	2	1
Sponsor	Flood Control Act of 1950	42	1	2	-	-
None	Emergency	8	-	-	-	-
None	Rivers and Harbors Act	4	-	-	-	-
Destroyed	Various Acts	2	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Floodplain inundation mapping was conducted for the Mainstem Willamette River instead of HEC-RAS modeling during the 2013 consequence analysis (USACE 2013). In the Upper Mainstem Willamette River Subbasin, 25 revetment projects were assessed (the Harper Bend project was split into two revetments because a drainage channel bisects the revetment; depicted in Table 3-20 as Harper Bend D/S and Harper Bend U/S).

Twelve of the projects did not have inundation associated with the 50 percent annual exceedance probability event because the floodplain behind the revetment was higher than the 50 percent annual exceedance probability flood elevation, six of the revetment structures were overtopped by the 50 percent annual exceedance probability flood stage, and 8 provided some flood damage reduction for a 50 percent probability event (Table 3-20).

Table 3-20. Results of Inundation Mapping for USACE-maintained Revetments in the Upper Mainstem Willamette River Subbasin.

Revetment Name	50 Percent Annual Exceedance Probability Inundation Area (acres)	Overtopped by 50 Percent Annual Exceedance Probability Event
Alford	-	N/A
Bauer Land D/S Ext.	-	N/A
Black Dog Bar	1,160.80	No
Brown Location	-	N/A
City of Corvallis	-	N/A
City of Harrisburg	-	N/A
Corvallis	699.4	No
Ferry Street Bridge	-	N/A
Fertile Dist. Location 8	1,295.10	No
Half Moon Bend	1,133.70	Yes
Harper Bend D/S	-	N/A
Harper Bend U/S	-	N/A
Harrisburg RR BR APP	-	N/A
Ingram Island	7,561.10	Yes
Irish Bend	3,785.80	No
John Smith Island	21.2	Yes
Location 7A	616.8	Yes
Location 8A	1,154.00	No
Location No. 9	-	N/A
Location No. 9 U/S Ext.	6.5	No
Lower Bend	2,150.7	Yes
Lower Goodpasture	-	N/A
Ufford	76.8	Yes
Upper Goodpasture	-	N/A
Upper Half Moon Bend	370.1	No
Wilbur Bend	1.5	No

Source: USACE 2013
N/A = Not Applicable

3.4.9 Clackamas River Subbasin

USACE constructed 11 structures in the Clackamas River Subbasin (Figure 3-11). Approximately 2,500 linear feet of structures are under USACE responsibility in this subbasin (Table 3-21).

USACE has operations and maintenance responsibility for two of these structures, seven structures have been conveyed to sponsors (Table 3-21). Two of the revetments have been destroyed.

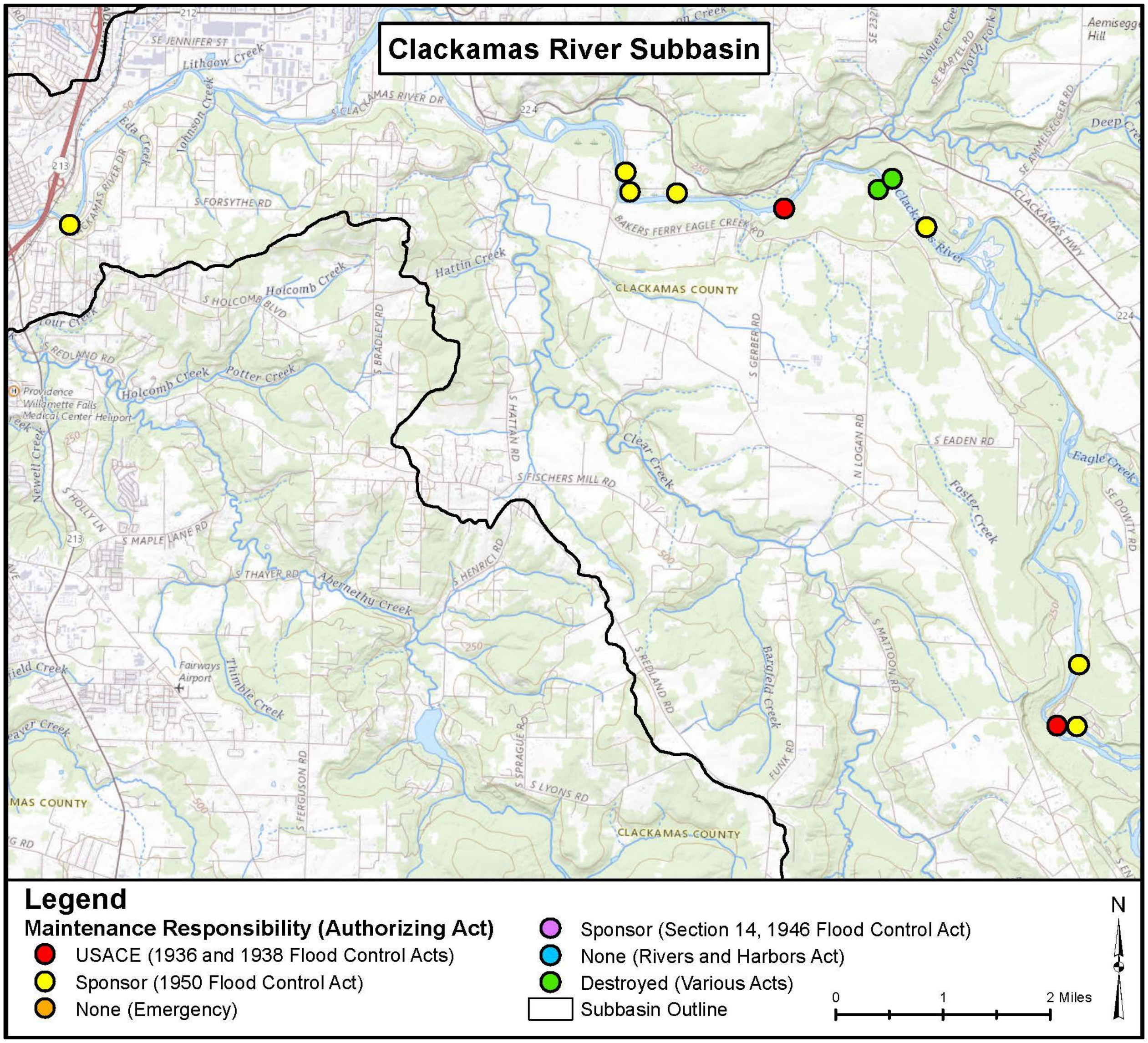

Figure 3-11. Structure Centerpoint Location and Operations and Maintenance Responsibility of Clackamas River Subbasin Revetments.

Table 3-21. Length of Clackamas River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	2,491	-	-	-	-
Sponsor	Flood Control Act of 1950	12,373	-	-	-	-
None	Emergency	-	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	1,585	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Table 3-22. Number of Clackamas River Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	2	-	-	-	-
Sponsor	Flood Control Act of 1950	7	-	-	-	-
None	Emergency	-	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	2	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

None of the Clackamas River Subbasin revetment projects were analyzed for additional inundation during the 2013 consequence assessment (USACE 2013).

3.4.10 Molalla and Pudding Rivers Subbasin

USACE constructed 18 structures in the Molalla and Pudding Rivers Subbasin (Figure 3-12). Approximately 13,500 linear feet of structures are under USACE responsibility in this subbasin (Table 3-23).

USACE has responsibility for eight of these structures, seven have been conveyed to sponsors, and one was constructed under emergency authorization and does not have a sponsor (Table 3-24). Two of the revetments have been destroyed.

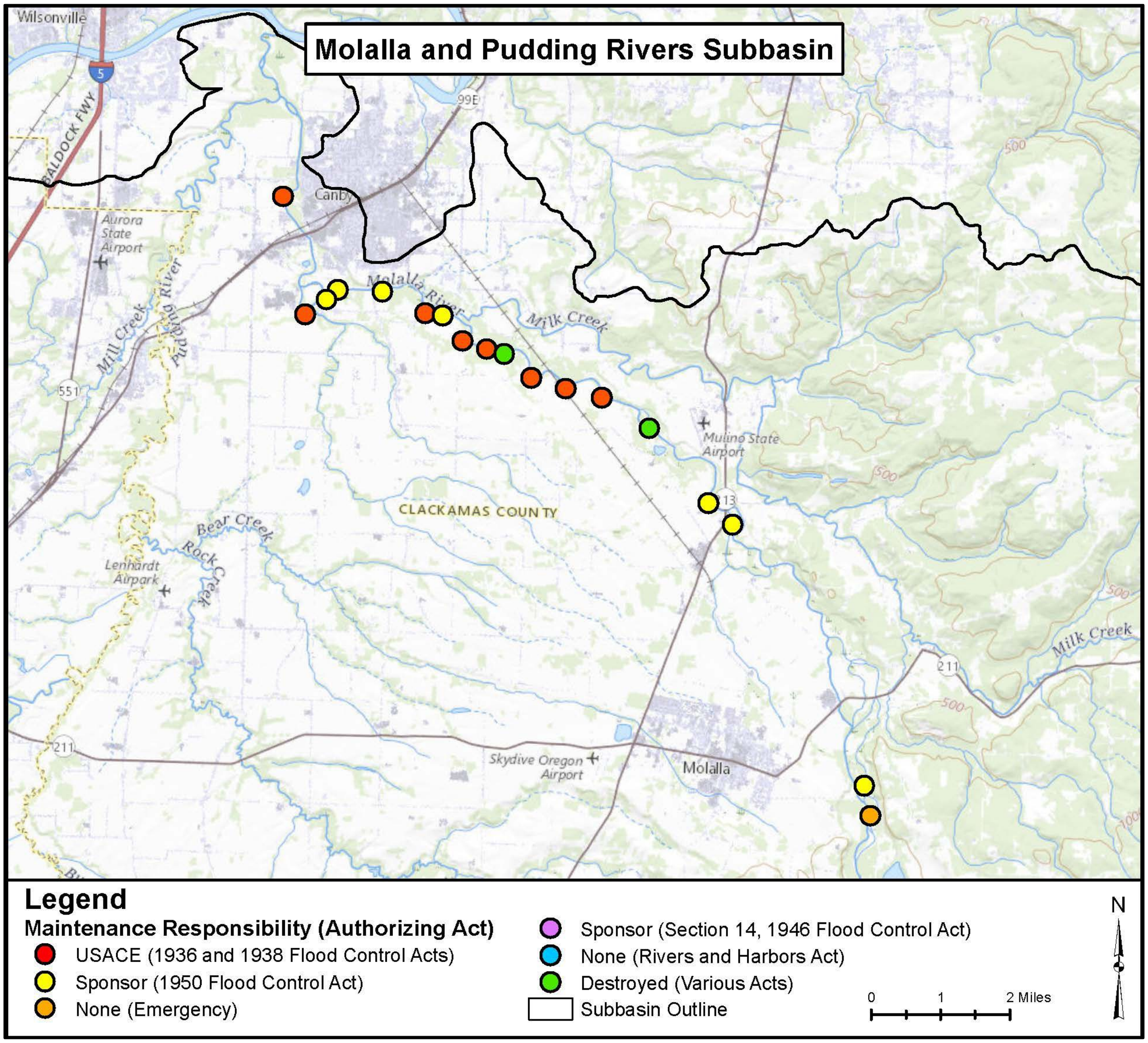

Figure 3-12. Structure Centerpoint Location and Operations and Maintenance Responsibility of Molalla and Pudding Rivers Subbasin Revetments.

Table 3-23. Length of Molalla and Pudding Rivers Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment (linear feet)	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	13,597	-	-	-	-
Sponsor	Flood Control Act of 1950	26,993	-	-	-	-
None	Emergency	460	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	6,895	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

Table 3-24. Number of Molalla and Pudding Rivers Subbasin Structures by Operations and Maintenance Responsibility, Authorizing Act, and Structure Type.

Responsibility	Authorization	Revetment	Groin	Drift Barrier	Embankment	Plug
USACE	Flood Control Acts of 1936 and 1938	8	-	-	-	-
Sponsor	Flood Control Act of 1950	7	-	-	-	-
None	Emergency	1	-	-	-	-
None	Rivers and Harbors Act	-	-	-	-	-
Destroyed	Various Acts	2	-	-	-	-
Sponsor	Section 14, 1946 Flood Control Act	-	-	-	-	-

None of the Molalla and Pudding Rivers Subbasin revetment projects were analyzed for additional inundation during the 2013 consequence assessment (USACE 2013).

4. WILLAMETTE VALLEY SYSTEM DAM AND RESERVOIR DESCRIPTIONS BY SUBBASIN

Each of the WVS dams and reservoirs are described below by subbasin and are summarized in Table 4-1. Descriptions are presented in the approximate order of where their flow enters the Willamette River from upstream to downstream.

Table 4-1. Congressionally Authorized Purposes of the Willamette Valley System.

Congressionally Authorized Purpose	Detroit Dam	Big Cliff Dam	Green Peter Dam	Foster Dam	Cougar Dan	Blue River Dam	Hills Creek Dam	Lookout Point Dam	Dexter Dam	Fall Creek Dam	Dorena Dam	Cottage Grove Dam	Fern Ridge Dam
Flood Control	✓	–	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓
Irrigation	✓	–	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓
Navigation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hydropower	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	–
Fish and Wildlife	✓	–	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓
Water Quality	✓	–	✓	✓	✓	✓	✓	✓	–	✓	✓	✓	✓
Recreation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water Supply	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4.1 Middle Fork Willamette River Subbasin

The Middle Fork Willamette Subbasin is situated at the southern (upstream or headwaters) end of the Willamette River Basin and has a drainage area of about 1,569 square miles, or 14 percent of the entire Willamette River Basin (Figure 4-1). This subbasin ranges in elevation from 450 feet at Eugene, Oregon, to 8,790 feet at Diamond Peak. Most of this subbasin is located within national forests and contains four WVS reservoirs: Hills Creek, Lookout Point, Dexter, and Fall Creek Reservoirs.

4.1.1 Hills Creek Dam and Reservoir

Hills Creek Dam and Reservoir are located on the Middle Fork Willamette River 4 miles southwest of Oakridge, Oregon (Figure 4-2). The dam is an earth-fill structure that was completed in 1962 with a gated concrete spillway and outlet works for regulating reservoir levels (USACE 2020; USACE 2015).

The reservoir provides 350,000 acre-feet of storage and controls runoff for a 390-square-mile drainage area. The dam has two hydropower generating units capable of producing a total of 36 megawatts. This dam is authorized for the purposes of flood control, irrigation, navigation, hydropower, fish and wildlife, water quality, recreation, and water supply (USACE 2020).

4.1.2 Lookout Point Dam and Reservoir

Lookout Point Dam and Reservoir are located on the Middle Fork Willamette River about 22 miles southeast of Eugene, Oregon (Figure 4-3). The dam is an earth and gravel-filled structure with concrete gated spillways (USACE 2020). The majority of the construction of Lookout Point Dam, including the powerhouse, was completed in 1953. Lookout Point Reservoir provides 438,200 acre-feet of storage.

All three hydropower generating units were completed by 1955 (USACE 2015) and have a combined capacity of 146 megawatts (USACE 2020). Lookout Point Dam is authorized for the purposes of flood control, irrigation, navigation, hydropower, fish and wildlife, water quality, recreation, and water supply.

4.1.3 Dexter Dam and Reservoir

Dexter Dam and Reservoir are located on the Middle Fork of the Willamette River about 22 miles southeast of Eugene, Oregon and 3 miles downstream of Lookout Point Dam (Figure 4-4). The dam is an earth- and gravel-fill embankment structure with concrete gated spillways that regulate power-generating water releases from Lookout Point Dam. The total generation capacity of the hydropower units is 17 megawatts (USACE 2020).

Dexter Dam was completed in 1954 and was authorized for the purposes of hydropower, recreation, and water supply (USACE 2020). Dexter Reservoir provides 27,300 acre-feet of storage.

4.1.4 Fall Creek Dam and Reservoir

Fall Creek Dam and Reservoir are located on Fall Creek, a tributary of the Willamette River, about 20 miles southeast of Eugene, Oregon (USACE 2020) (Figure 4-5). The dam is a rockfill structure with a gated concrete spillway and outlet works for regulating reservoir levels. Fall Creek Reservoir provides 116,000 acre-feet of storage. This dam does not generate power.

Construction of this dam and reservoir was completed in 1965. Fall Creek Dam controls runoff from 184 square miles of drainage area and is authorized for the purposes of flood control, irrigation, navigation, fish and wildlife, water quality, recreation, and water supply (USACE 2020).

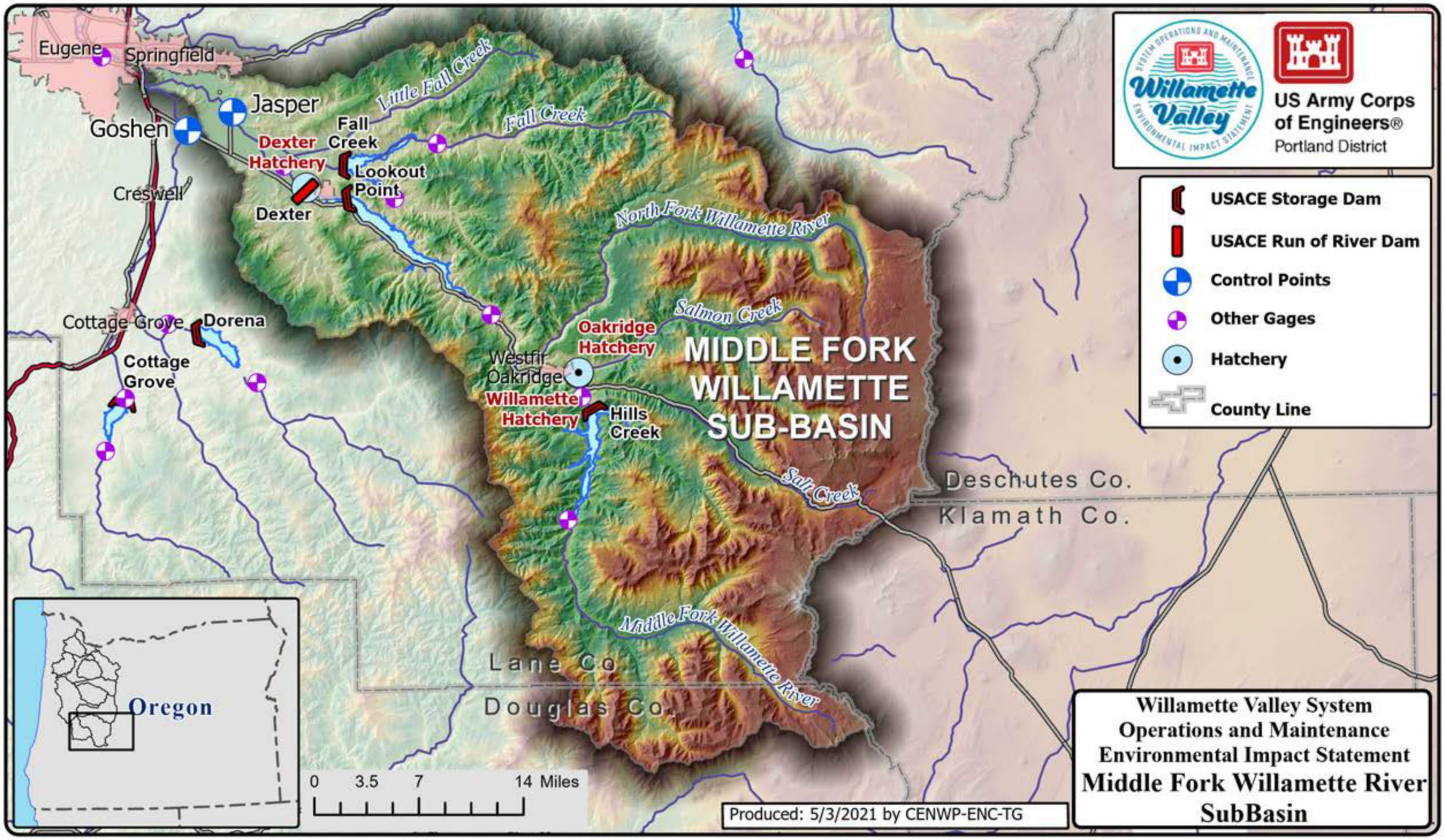

Figure 4-1. Middle Fork Willamette River Subbasin.

Figure 4-2. Hills Creek Dam and Reservoir.

Figure 4-3. Lookout Point Dam and Reservoir.

Figure 4-4. Dexter Dam and Reservoir.

Figure 4-5. Fall Creek Dam and Reservoir.

4.2 Coast Fork Willamette River Subbasin

The Coast Fork Willamette River Subbasin is situated in the southwestern portion of the Willamette River Basin, directly to the west of the Middle Fork Willamette River Subbasin described above (Figure 4-6). It has a drainage area of approximately 669 square miles, or about 6 percent of the entire Willamette River Basin.

Elevations in the Coast Fork drainage subbasin range from about 450 feet at Eugene, Oregon, to 6,000 feet at the headwaters. The drainage headwaters consist largely of steep, rugged, heavily forested mountainous terrain dissected by narrow river valleys. This subbasin contains two WVS dams and reservoirs: Cottage Grove and Dorena Dams and Reservoirs.

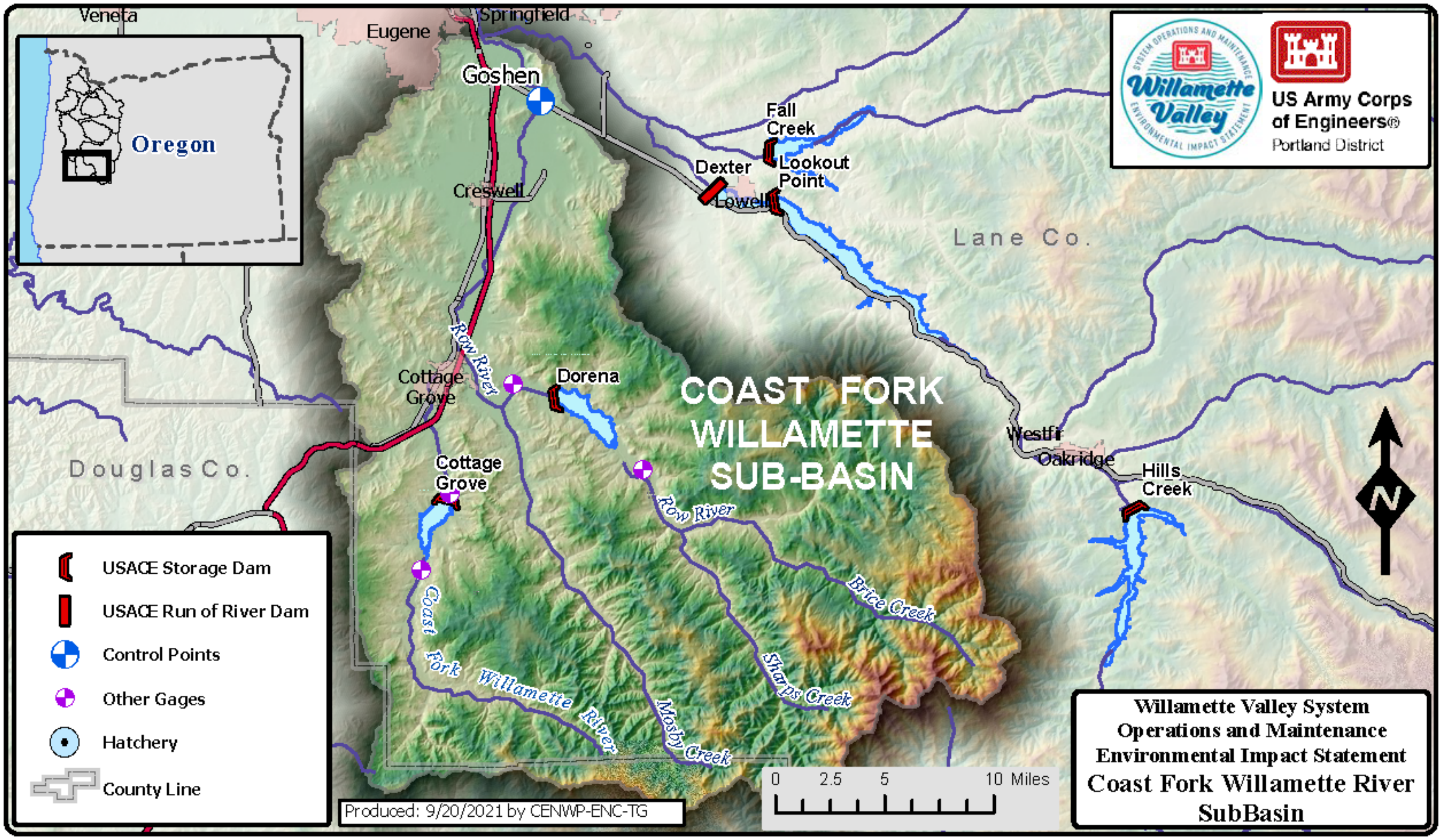

Figure 4-6. Coast Fork Willamette River Subbasin.

4.2.1 Cottage Grove Dam and Reservoir

Cottage Grove Dam and Reservoir are located on the Coast Fork of the Willamette River about 5 miles south of Cottage Grove, Oregon (Figure 4-7). The dam is an earth-fill structure with a concrete spillway and controls runoff from 104 square miles of land in the Coast Fork Willamette River Subbasin. Construction of this dam and reservoir was completed in 1942.

Figure 4-7. Cottage Grove Dam and Reservoir.

The reservoir provides 31,800 acre-feet of storage. This dam is authorized for the purposes of flood control, irrigation, navigation, fish and wildlife, water quality, recreation, and water supply (USACE 2020). This dam does not generate power.

4.2.2 Dorena Dam and Reservoir

Dorena Dam and Reservoir are located on the Row River, a tributary of the Willamette River, about 6 miles east of Cottage Grove, Oregon (Figure 4-8). The dam is an earth-fill structure with a concrete spillway and controls runoff from a 265-square-mile drainage area. The reservoir provides 72,100 acre-feet of storage. This dam was completed in 1949 and is authorized for the purposes of flood control, irrigation, navigation, fish and wildlife, water quality, recreation, and water supply (USACE 2020).

Figure 4-8. Dorena Dam and Reservoir.

Dorena Dam also includes a privately operated hydropower unit that began operation in 2014 and is licensed by the Federal Energy Regulatory Commission (FERC). The unit consists of two turbines: one high flow and one low flow. Only one of the units is in operation at any given time, meaning that approximately one-half of the generating capacity is utilized depending on flow conditions.

The hydropower unit is a run-of-the-river plant utilizing flows released from Dorena Reservoir. The run-of-the-river designation means that the plant does not control flows, but rather uses the flows dictated by USACE operation of Dorena Dam. Any hydropower production at Dorena Dam is incidental to USACE operations and does not substantially affect any of the USACE multipurpose missions.

4.3 McKenzie River Subbasin

The McKenzie River Subbasin is situated in the southeast portion of the Willamette River Basin and has a drainage area of approximately 1,300 square miles, or 12 percent of the Willamette River Basin (Figure 4-9). The McKenzie River is about 90 miles long and joins the mainstem Willamette River a few miles north of Eugene, Oregon. Elevations within the subbasin range from 350 feet to 6,650 feet. Higher elevations in the headwaters of the subbasin are rugged and heavily forested.

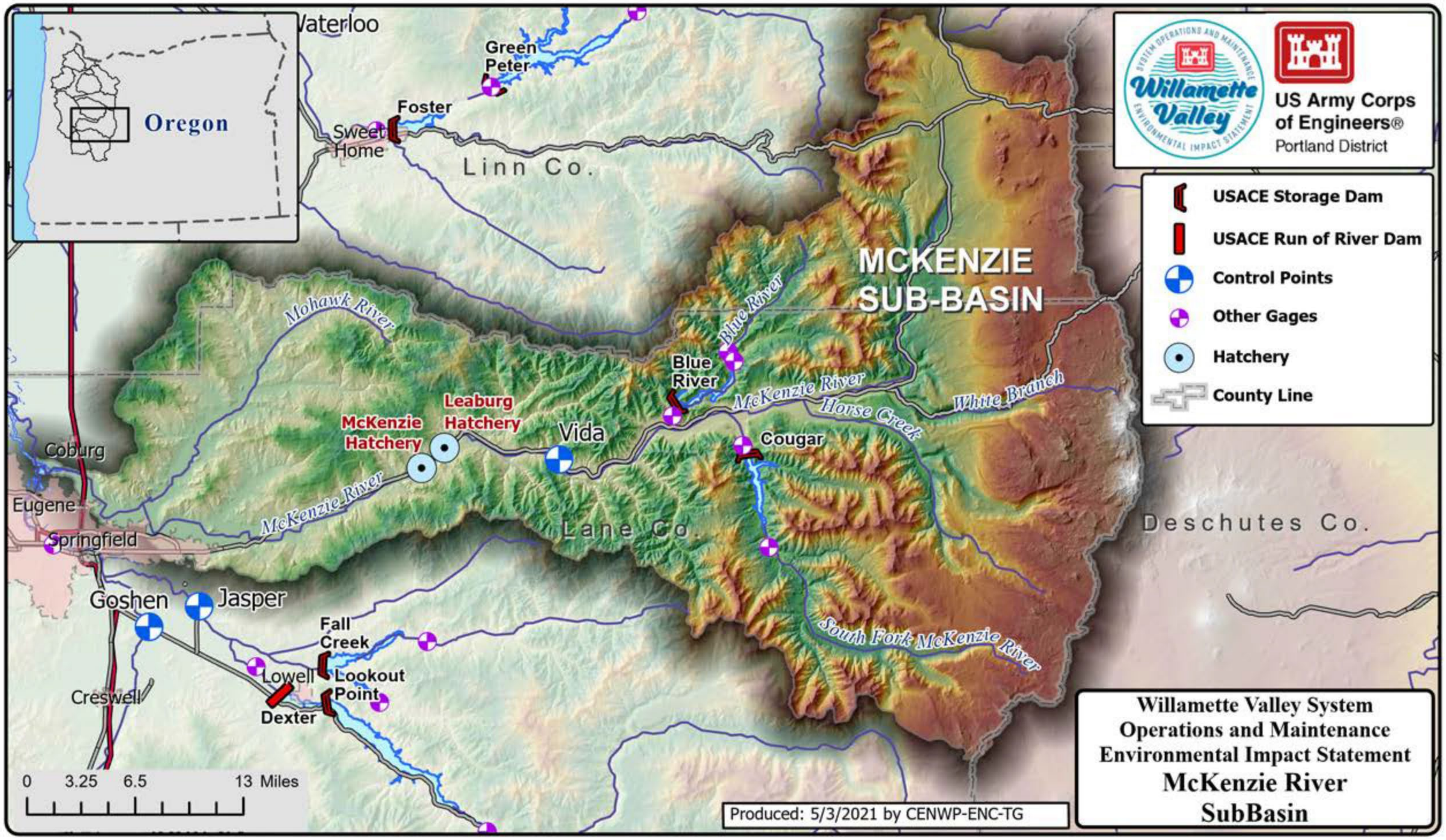

Figure 4-9. McKenzie River Subbasin.

The McKenzie River Subbasin contains two WVS dams: Blue River and Cougar Dams. Two non-Federal dams are also located in the McKenzie River Subbasin: Carmen-Smith Hydroelectric Project on the upper McKenzie River and Leaburg-Walterville Hydroelectric Project on the lower McKenzie River.

4.3.1 Blue River Dam and Reservoir

Blue River Dam and Reservoir are located on a tributary of the McKenzie River about 38 miles east of Eugene, Oregon (Figure 4-10). The dam is a rockfill structure with a gated concrete spillway. The reservoir provides 82,800 acre-feet of storage and controls runoff from an 88-square-mile drainage area (USACE 2020).

This dam was completed in 1969 and is authorized for the purposes of flood control, irrigation, navigation, hydropower, fish and wildlife, water quality, recreation, and water supply (USACE 2020). While hydropower is one of the authorized purposes, no generators have been constructed or installed at this dam.

4.3.2 Cougar Dam and Reservoir

Cougar Dam and Reservoir are located on the South Fork McKenzie River, a Willamette River tributary, about 42 miles east of Eugene, Oregon (Figure 4-11). Cougar Reservoir has a storage capacity of 189,000 acre-feet and controls runoff from a 208-square-mile drainage area (USACE 2020). The dam is a rockfill structure with a gated concrete spillway that was completed in 1964.

This dam is authorized for the purposes of flood control, irrigation, navigation, hydropower, fish and wildlife, water quality, recreation, and water supply. The total capacity of the two hydropower generating units at this dam is 30 megawatts (USACE 2020). In 2004, USACE completed construction of a water temperature control tower at Cougar Dam, which improved downstream conditions for ESA-listed fish species.

Figure 4-10. Blue River Dam and Reservoir.

Figure 4-11. Cougar Dam and Reservoir.

4.4 Long Tom River Subbasin

The Long Tom River Subbasin is situated in the southwest portion of the Willamette River Basin, north of the Coast Fork Willamette River Subbasin. It is relatively low-lying, with a maximum elevation of 2,125 feet (Figure 4-12). The Long Tom River Subbasin includes one WVS dam: Fern Ridge Dam.

Below Fern Ridge Dam, the Long Tom River meanders before joining the mainstem Willamette River north of Monroe, Oregon. The Long Tom River below Fern Ridge Dam is channelized with embankments. The river was shortened from 36.5 miles to 23.6 miles.

A series of seven drop structures were also built with the intent to reduce channel velocity and to decrease erosion while still moving water downstream efficiently. Three of the seven drop structures, one at Monroe, Oregon (RM 6.7), one at the Stroda property (RM 10.2), and one just upstream of Ferguson Road (RM 12.7), are constructed of concrete and range in height from 7.5 feet to 11.5 feet. The remaining four structures are small rock riffle weirs located in the uppermost 4 miles of the constructed channel. Operation and maintenance of all seven structures is minimal.

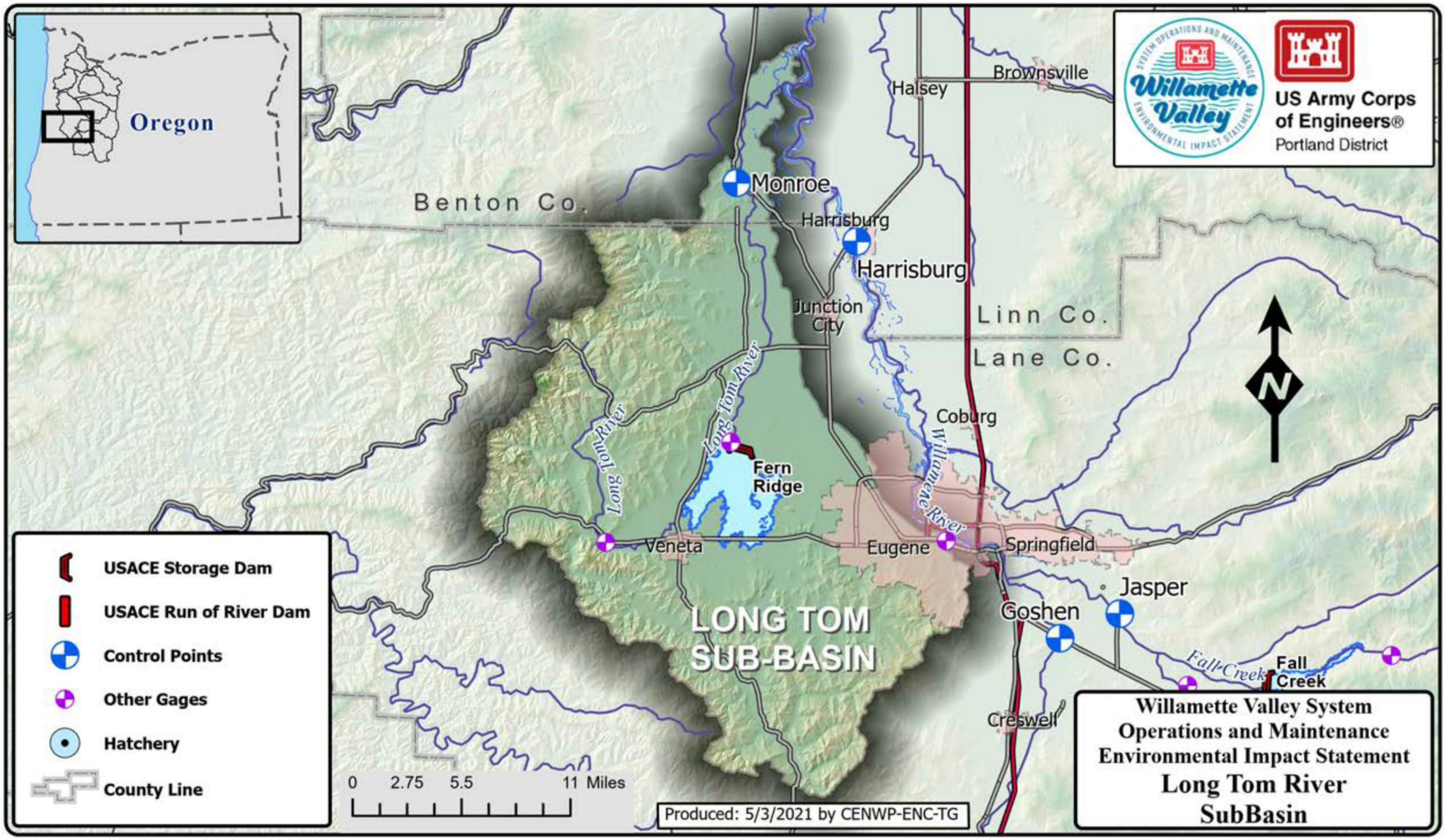

Figure 4-12. Long Tom River Subbasin.

4.4.1 Fern Ridge Dam and Reservoir

Fern Ridge Dam and Reservoir are on the Long Tom River, a tributary of the Willamette River, about 12 miles west of Eugene, Oregon (Figure 4-13); it is the only dam in the WVS west of Interstate 5. Fern Ridge Dam is an earth-fill structure that includes a gated concrete spillway and outlet works for regulating reservoir levels. The dam was completed in 1941 and was the first WVS dam constructed by USACE (USACE 2020).

Figure 4-13. Fern Ridge Dam and Reservoir.

The reservoir provides 97,300 acre-feet of storage and controls runoff from a 275-square-mile drainage area. This dam is authorized for the purposes of flood control, irrigation, navigation, fish and wildlife, water quality, recreation, and water supply (USACE 2020). This dam does not generate power.

In 1950, a project was completed that altered the lower Long Tom River from the dam to its confluence with the Willamette River. Alterations to the Long Tom River were made to control the subsequent flooding created by the Fern Ridge Dam construction, enabling USACE to maintain its flood risk management mission downstream of the dam.

In 1965 the dam was raised 1.6 feet for additional storage, and in 1987 the spillway and outlet works were modified. A Supervisory Control and Data Acquisition system was installed in 1992 to control the spillway gates (USACE 2015).

In 2005 to 2006, USACE repaired the failed internal drainage system in the earth-fill embankment, which had caused depressions and seepage on the downstream dam slope. Repair work included excavation of the downstream face of the dam, replacement of the drainage system, and reconstruction of the embankment (Daily Journal of Commerce 2005).

4.5 South Santiam River Subbasin

The South Santiam River Subbasin is situated in the east-central part of the Willamette River Basin and encompasses a drainage area of approximately 1,827 square miles, or about 16 percent of the Willamette River Basin. This subbasin includes the North, Middle, and South Santiam Rivers (Figure 4-14). The Santiam River Subbasin elevations range between 200 feet and 10,495 feet and average 2,040 feet above mean sea level.

The South Santiam River, roughly 66 miles long, drains an area of approximately 1,040 square miles in geologically older terrain. The Middle Santiam River, a tributary of the South Santiam River, flows through steep, heavily forested mountain terrain, draining an area of 287 square miles.

The Middle and South Santiam rivers meet in Foster Reservoir; from there, the South Santiam flows northwest to near Jefferson where it joins the North Santiam River to form the mainstem Santiam River. The mainstem Santiam River flows for 11.7 miles to its confluence with the Willamette River. There are two WVS dams in the South Santiam Subbasin: Green Peter and Foster Dams.

4.5.1 Green Peter Dam and Reservoir

Green Peter Dam and Reservoir are located on the Middle Santiam River (within the South Santiam River Subbasin), 11 miles northeast of Sweet Home, Oregon (Figure 4-15). The dam is a concrete structure with a gated spillway. Construction of this dam and reservoir was completed in 1967 and it is authorized for the purposes of flood control, irrigation, navigation, hydropower, fish and wildlife, water quality, recreation, and water supply.

The Green Peter Reservoir provides 409,800 acre-feet of storage. Total output from two hydropower generating units is 98 megawatts (USACE 2020).

4.5.2 Foster Dam and Reservoir

Foster Dam and Reservoir are located on the South Santiam River at the confluence of the South Santiam and Middle Santiam Rivers, approximately 4 miles northeast of Sweet Home, Oregon (Figure 4-16). Foster Dam is a rockfill structure with a concrete gated spillway used to regulate power-generating water releases from Green Peter Dam and flows from the South Santiam River (USACE 2020). Construction of this dam was completed in 1968.

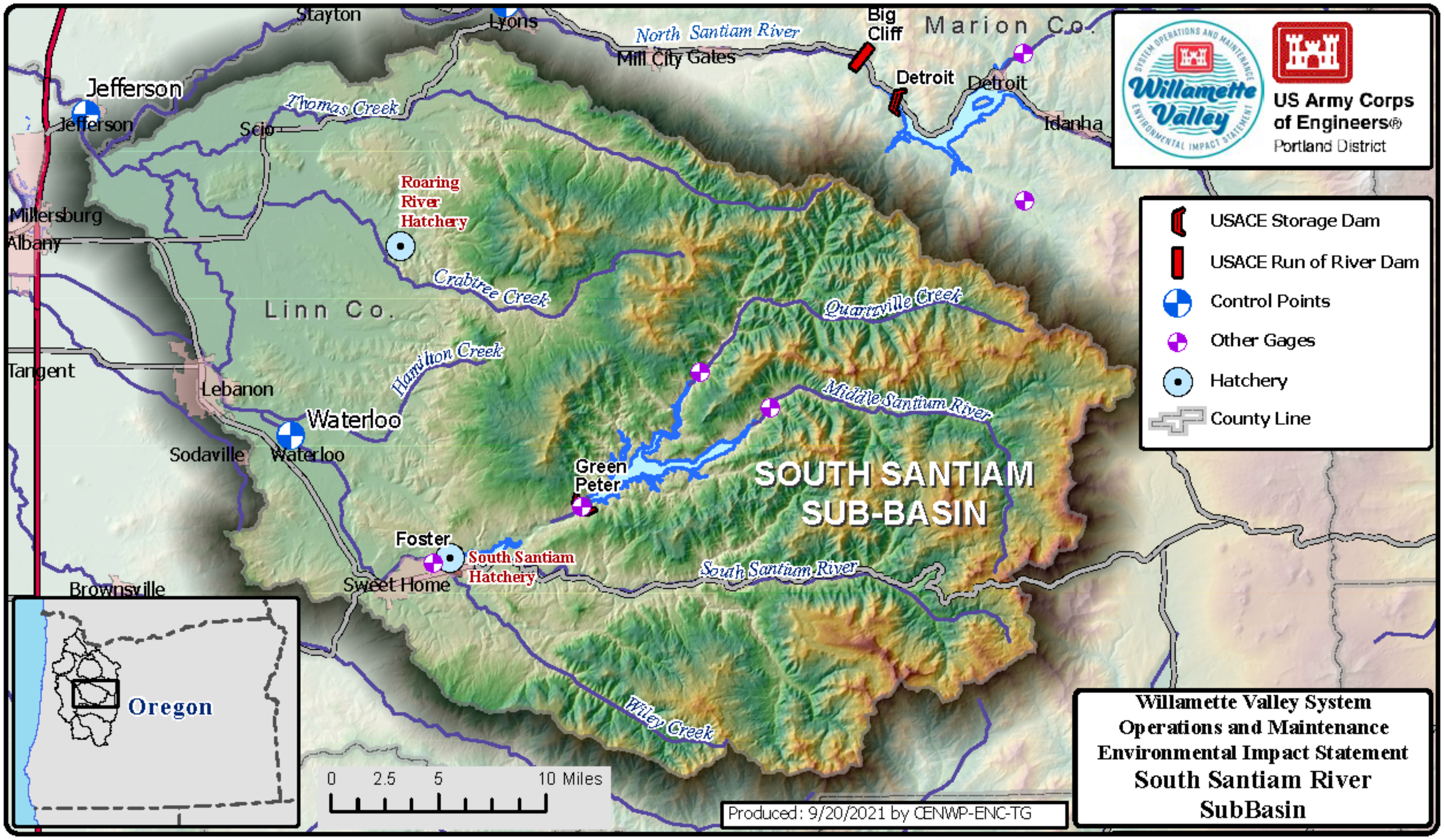

Figure 4-14. South Santiam River Subbasin.

Figure 4-15. Green Peter Dam and Reservoir.

Figure 4-16. Foster Dam and Reservoir.

Foster Reservoir provides 55,900 acre-feet of storage. This dam is authorized for the purposes of flood control, irrigation, navigation, hydropower, fish and wildlife, water quality, recreation, and water supply. Total output from two hydropower generators is 24 megawatts (USACE 2020).

4.6 North Santiam River Subbasin

The North Santiam River Subbasin is situated in the east-central portion of the Willamette River Basin and is about 92 miles long (Figure 4-17). It drains an area of approximately 655 square miles, or about 6 percent of the Willamette River Basin.

The subbasin contains heavily forested watersheds and high plateaus with scattered volcanic peaks and rugged slopes in the Cascade Range. The North Santiam Subbasin contains two WVS dams: Detroit and Big Cliff Dams.

4.6.1 Detroit Dam and Reservoir

Detroit Dam and Reservoir are located on the North Santiam River approximately 50 miles southeast of Salem, Oregon (Figure 4-18). At full pool elevation (1,569 feet), Detroit Reservoir covers an area of 3,580 acres with 428,800 acre-feet of usable storage at the confluence of the North Santiam and Breitenbush Rivers (USACE 2019a).

The concrete gravity dam was constructed primarily for flood risk management (USACE 2020), though its authorized purposes also include irrigation, navigation, hydropower, fish and wildlife, water quality, recreation, and water supply.

In 1953, construction was completed, the spillway gates and two generators were installed, and initial power from the first generator was delivered to BPA (USACE 2015). Total output from two hydropower generators is 127.8 megawatts (USACE 2020).

4.6.2 Big Cliff Dam and Reservoir

Big Cliff Dam and Reservoir are located about 3 miles downstream of Detroit Dam on the North Santiam River, about 45 miles southeast of Salem, Oregon (Figure 4-19). Big Cliff Dam is a re-regulating, concrete structure with gated spillways.

Big Cliff Reservoir is a small reservoir that provides 6,430 acre-feet of storage. It is used to even out peak discharges of water utilized for power generation at Detroit Dam, thereby controlling downstream river level fluctuations (USACE 2019a).

This dam was completed in 1954 and is authorized for the purposes of hydropower, recreation, and water supply. Total output from the single generator is 23 megawatts (USACE 2020).

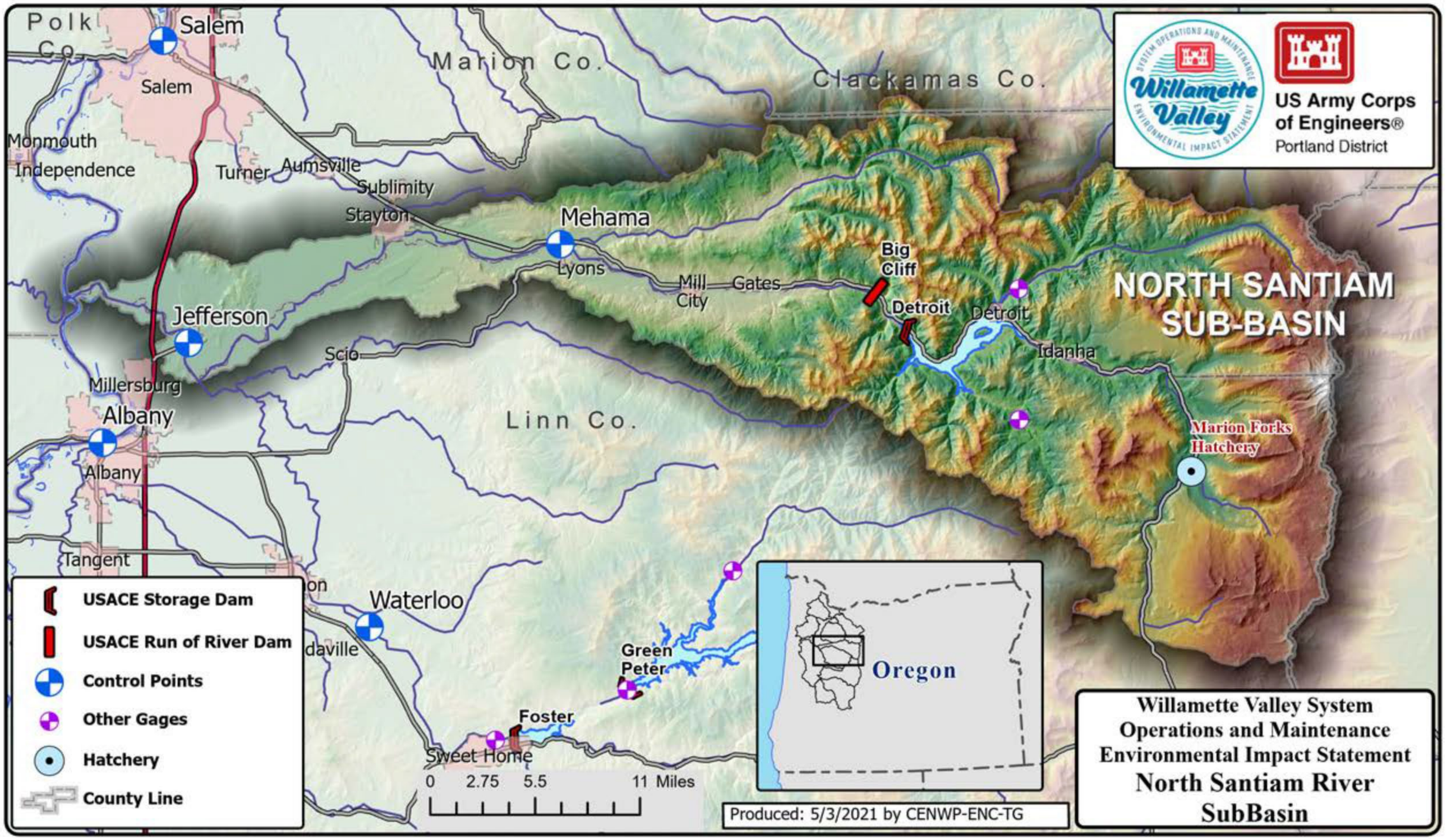

Figure 4-17. North Santiam River Subbasin.

Figure 4-18. Detroit Dam and Reservoir.

Figure 4-19. Big Cliff Dam and Reservoir.

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