Appendix 2A
Existing Condition Flood Risk Summary Table

Appendix Table 2A: Existing Condition Flood Risk Summary Table

County	Area in Flood Planning Region (sq. mi.)	1% Annual Chance Flood Risk										0.2% Annual Chance Flood Risk*							
		Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (daytime)	Population (nighttime)	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)
Andrews	269	85	9	0	41	30	41	0	8	18	0	20	1	0	2	0	2	5	0
Brewster	6,171	1,238	2,640	1,615	4,943	7,217	7,217	81	210	43	7	170	351	213	838	16	30	6	0
Crane	782	227	277	0	293	591	591	7	41	3	1	74	94		189	0	19	0.9	2
Crockett	2,720	527	1,292	680	1,027	2,392	2,392	80	187	7	8	53	169	83	296	39	23	0.6	0
Culberson	3,799	843	567	115	362	1,382	1,382	90	317	32	0	116	87	32	183	17	33	4	0
Ector	282	63	340	234	346	606	606	0	26	0.4	0	18	100	80	152	2	8	0.1	0
Edwards	444	91	58	27	5	127	127	11	19	0.3	0	6	8	1	18	2	1	0.02	0
El Paso	1,010	179	21,377	16,860	68,858	70,260	70,260	457	458	61	37	66	8,450	6,416	33,947	245	149	15	24
Hudspeth	4,550	937	823	44	1,002	1,629	1,629	70	288	246	2	218	93	2	205	38	31	61	0
Jeff Davis	2,254	395	660	135	720	1,431	1,431	53	63	53	1	60	117	17	261	6	11	9	0
Loving	674	167	95	2	25	291	291	3	17	4	1	45	57	5	174	0	9	1	0
Midland	7	2	7	2	2	20	20	0	3	0.004	0	1	7	6	19	0	0	0.0001	0
Pecos	4,744	1,055	1,040	370	2,713	3,424	3,424	182	284	47	9	256	466	247	1,325	31	100	11	4
Presidio	3,841	734	1,353	696	1,081	2,973	2,973	101	122	45	0	114	272	138	518	24	24	9	1
Reagan	83	11	2	0	0	3	3	1	0.01	0.01	0	2	0	0	0	0	0	0.001	0
Reeves	2,632	717	3,535	1,580	6,287	10,707	10,707	72	337	18	10	238	1,174	473	3,805	38	133	9	2
Schleicher	332	50	33	5	6	73	73	29	5	4	0	8	7	0	21	0	2	1	0
Sutton	798	154	963	492	1,336	1,562	1,562	0	96	2	5	11	173	100	337	29	9	0.1	1
Terrell	2,349	453	391	146	149	945	945	50	51	3	2	49	105	43	246	13	11	0.3	0
Upton	759	140	331	185	388	599	599	21	28	1	3	26	313	198	773	2	15	0.1	2
Val Verde	2,871	656	577	147	102	1,393	1,393	38	163	22	0	45	95	15	235	17	14	0.9	0
Ward	833	281	2,071	470	2,508	4,189	4,189	30	196	4	4	70	1,131	294	2,152	29	73	1	3
Winkler	827	281	1,680	1,126	2,101	3,675	3,675	1	126	3	4	91	1,020	743	2,289	0	48	0.7	2
Total	43,031	9,285	40,121	24,931	94,295	115,519	115,530	1,377	3,047	615	94	1,755	14,290	9,106	47,985	548	746	135	41

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

Appendix Table 2A: Existing Condition Flood Risk Summary Table (Continued)

County	Possible Flood Prone Areas								Average SVI of features in floodplain or flood prone areas
	Area (sq. mi.)	Number of Structures in Flood Prone Area	Residential Structures in Flood Prone Area	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	
Andrews	-	-	-	-	-	-	-	-	0.234
Brewster	0.3	151	134	404	2	5	0.001	0	0.515
Crane	-	-	-	-	-	-	-	-	0.559
Crockett	-	-	-	-	-	-	-	-	0.607
Culberson	-	-	-	-	-	-	-	-	0.935
Ector	-	-	-	-	-	-	-	-	0.593
Edwards	-	-	-	-	-	-	-	-	0.470
El Paso	24[a]	10,961	8,970	67,082	46	345	8	17	0.665
Hudspeth	251[b]	906	56	2,585	93	2	31	2	0.932
Jeff Davis	-	-	-	-	-	-	-	-	0.408
Loving	1	9	0	25	2	0	0.01	0	0.502
Midland	-	-	-	-	-	-	-	-	0.664
Pecos	-	-	-	-	-	-	-	-	0.502
Presidio	7[c]	53	43	138	3	1	0.1	0	0.916
Reagan	-	-	-	-	-	-	-	-	0.558
Reeves	1	45	12	107	1	0.4	0.01	0	0.646
Schleicher	-	-	-	-	-	-	-	-	0.534
Sutton	-	-	-	-	-	-	-	-	0.651
Terrell	-	-	-	-	-	-	-	-	0.453
Upton	-	-	-	-	-	-	-	-	0.539
Val Verde	-	-	-	-	-	-	-	-	0.549
Ward	1	268	0	695	0	0	0.001	0	0.531
Winkler	-	-	-	-	-	-	-	-	0.555
Total	285	12,393	9,215	71,036	147	353	39	19	

a. Approximately 6 sq. mi. of the area assigned to El Paso County is located in Mexico near the Texas-Mexico border
b. Approximately 111 sq. mi. of the area assigned to Hudspeth County is located in Mexico near the Texas-Mexico border
c. Approximately 3 sq. mi. of the area assigned to Presidio County is located in Mexico near the Texas-Mexico border

Appendix 2B
Future Condition Flood Risk Summary Table

Appendix Table 2B: Future Condition Flood Risk Summary Table

County	Area in Flood Planning Region (sq. mi.)	1% Annual Chance Flood Risk								0.2% Annual Chance Flood Risk*							
		Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)
Andrews	269	85	9	0	41	0	8	18	0	20	1	0	2	0	2	5	0
Brewster	6,171	1,239	2,798	1,730	7,534	82	214	43	7	171	359	234	856	16	32	6	0
Crane	782	228	333	0	950	9	42	3	3	74	128	0	249	0	20	0.9	2
Crockett	2,720	527	1,396	764	2,577	80	189	7	8	53	77	7	135	40	23	0.6	0
Culberson	3,799	843	629	148	1,482	91	319	32	0	116	443	327	1,094	17	42	4	2
Ector	282	63	340	234	606	0	26	0.4	0	18	100	80	152	2	8	0.1	0
Edwards	444	91	58	27	127	11	19	0.3	0	6	8	1	18	2	1	0.02	0
El Paso	1,010	356	46,530	37,576	204,426	530	1,199	99	112	105	29,219	24,513	96,095	280	420	25	43
Hudspeth	4,550	1,004	936	45	1,868	75	296	270	2	229	121	4	283	39	37	65	0
Jeff Davis	2,254	395	686	145	1,474	53	64	53	1	61	185	43	391	6	14	9	1
Loving	674	167	104	6	311	3	17	4	1	45	52	4	164	0	9	1	0
Midland	7	2	7	2	20	0	3	0.004	0	1	7	6	19	0	0	0.0001	0
Pecos	4,744	1,056	1,269	539	4,023	184	293	48	10	256	418	185	953	31	103	11	3
Presidio	3,841	735	1,447	768	3,125	101	125	45	0	114	421	240	774	24	26	9	1
Reagan	83	11	2	0	3	1	0.01	0.01	0	2	0	0	0	0	0	0.001	0
Reeves	2,632	717	3,550	1,586	10,726	74	341	18	10	238	1,208	478	3,993	38	134	9	2
Schleicher	332	50	33	5	73	0	5	4	0	8	7	0	21	0	2	1	0
Sutton	798	154	1,101	590	1,784	31	98	2	6	11	85	42	190	29	8	0.1	0
Terrell	2,349	453	424	173	1,028	50	51	3	2	49	83	21	184	13	10	0.3	0
Upton	759	140	377	211	689	22	30	1	4	26	440	302	843	2	16	0.1	1
Val Verde	2,871	656	587	155	1,409	38	163	22	0	45	88	8	222	17	14	0.9	0
Ward	833	287	2,650	518	5,319	31	211	4	7	70	753	246	1,549	29	67	1	0
Winkler	827	283	1,868	1,266	4,083	1	131	3	5	92	964	700	2,115	0	46	0.7	1
Total	43,031	9,543	67,134	46,487	253,678	1,467	3,846	678	178	1,807	35,167	27,441	110,302	585	1,035	149	56

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

Appendix Table 2B: Future Condition Flood Risk Summary Table (Continued)

County	Possible Flood Prone Areas								Average SVI of features in floodplain or flood prone areas
	Area (sq. mi.)	Number of Structures in Flood Prone Area	Residential Structures in Flood Prone Area	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	
Andrews	-	-	-	-	-	-	-	-	0.234
Brewster	0.3	151	134	404	2	5	0.001	0	0.515
Crane	-	-	-	-	-	-	-	-	0.559
Crockett	-	-	-	-	-	-	-	-	0.607
Culberson	-	-	-	-	-	-	-	-	0.935
Ector	-	-	-	-	-	-	-	-	0.593
Edwards	-	-	-	-	-	-	-	-	0.470
El Paso	24[a]	10,961	8,970	67,082	46	345	8	17	0.718
Hudspeth	251[b]	906	56	2,585	93	2	31	2	0.932
Jeff Davis	-	-	-	-	-	-	-	-	0.408
Loving	1	9	0	25	2	0	0.01	0	0.502
Midland	-	-	-	-	-	-	-	-	0.664
Pecos	-	-	-	-	-	-	-	-	0.502
Presidio	7[c]	53	43	138	3	1	0.1	0	0.916
Reagan	-	-	-	-	-	-	-	-	0.558
Reeves	1	45	12	107	1	0.4	0.01	0	0.646
Schleicher	-	-	-	-	-	-	-	-	0.534
Sutton	-	-	-	-	-	-	-	-	0.651
Terrell	-	-	-	-	-	-	-	-	0.453
Upton	-	-	-	-	-	-	-	-	0.545
Val Verde	-	-	-	-	-	-	-	-	0.549
Ward	1	268	0	695	0	0	0.001	0	0.532
Winkler	-	-	-	-	-	-	-	-	0.555
Total	285	12,393	9,215	71,036	147	353	39	19	

a. Approximately 6 sq. mi. of the area assigned to El Paso County is located in Mexico near the Texas-Mexico border

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c. Approximately 3 sq. mi. of the area assigned to Presidio County is located in Mexico near the Texas-Mexico border

Appendix 2C
Comparison of Draft Fathom Floodplain Data in Region 14 (Memo)

AquaStrategies
Water Planning, Science & Engineering

Memorandum

TO: Jeff Irvin, AECOM

FROM: Paul Southard, Aqua Strategies

THROUGH: Barney Austin, Aqua Strategies

DATE: August 6th, 2021

RE: Comparison of Draft Fathom Floodplain with 1D-Derived Floodplain Maps used in TWDB Floodplain Quilt in Region 14, West Texas

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This document details a comparison of floodplain maps produced by the Fathom pluvial and fluvial floodplain models at a 30m resolution and traditional 1D-derived floodplain mapping methods that are incorporated into the TWDB Flood Hazard Quilt[1] for TWDB flood mapping Region 14. Fathom results are compared to all four of the flood hazard maps available in the quilt, presented below in order of accuracy and subsequent prioritization in the TWDB flood quilt:

1. Preliminary recent National Flood Hazard Layer (NFHL) flood hazard zones
2. Effective NFHL flood hazard zones
3. Base Level Engineering (BLE) flood hazard maps.
4. First American Flood Data Services (FAFDS) flood hazard maps

In all cases, the comparison detailed here is of the 100-yr recurrence interval, 1% probability flood. Fathom fluvial defended and pluvial datasets are colored to show depth of flooding in cm, and any of the data sources from the TWDB Flood Hazard Quilt just show the areal extent of flooding. Note that Fathom pluvial and fluvial results are clipped for any depth less than 20 cm in an attempt to remove the many very small, disconnected, shallow areas of pluvial flooding in this dataset. Also, note that areas outside of the border of Texas, which can be seen somewhat in some of the figures, have invalid data and should not be considered in this comparison. Final Fathom datasets will be merged and combined with forthcoming coastal data to produce a final floodplain map. Final floodplain maps will also be converted to 3m resolution using downscaling techniques.

It is important to note that the Fathom model methodology in some cases differs from typical floodplain modeling that informs the NFHL and, subsequently, the FEMA Flood Insurance Rate Map (FIRM). For one thing, the Fathom model is a 2D model, and NFHL results are from 1D models. Fathom also uses high resolution topography data from LiDAR, which may only be implemented in some 1D modeling, or may be more recent than elevation datasets used in NFHL models. Additionally, Fathom may implement hydrologic structures that would affect flooding differently than NFHL models. It should be noted that levees in particular are implemented in the Fathom model by ensuring that water cannot enter service areas of levees for

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[1] https://twdb-flood-planning-resources-twdb.hub.arcgis.com/pages/flood-hazard-quilt

simulations where the return period is lower than the design standard of the levee. Levees that are represented in this way are those that are available in the USACE National Levees Database (NLD).

NFHL Preliminary Data

Preliminary NFHL data represents future updates to the NFHL map that have been released for review, and subsequently details results of very recent flood studies. In Region 14, preliminary data is only available in the vicinity of El Paso.

The Fathom data details floodplains north (Figure 1a upper left) and east (Figure 1b lower left and upper center) of the city that are not present in preliminary NFHL data. Additionally, wide swaths of the city adjacent to the Rio Grande are mapped as floodplains in the preliminary data and not included in the Fathom data (Figure 1a lower left), as well as large areas to the south and east of the city (Figure 1c lower center and top left). The Fathom and preliminary NFHL floodplains are reasonably similar in many of the smaller tributaries in this region (Figure 1a center, Figure 1b upper left, Figure 1c lower left).

NFHL Effective Data

Effective NFHL data is effective in the current FEMA FIRM (FIRM) and is available in some locations from "Detailed" studies and in others from "Approximate" studies. These data are combined here for the purposes of comparison against Fathom results. These data are only available in the southeast corner of El Paso, in an area that is much smaller than for the preliminary NFHL data.

In areas where NFHL data from a detailed study is available, it is typically much more extensive and continuous than Fathom results (Figure 2a and Figure 2b). That being said, there are also locations where NFHL detailed study flood zones are confined in narrow areas and are in close agreement with Fathom floodplains (Figure 2a lower right). Fathom also identifies more widespread, small areas of flooding than NFHL data (Figure 2b). Fathom does not identify flooding in portions of the Rio Grande that are available from NFHL approximate studies (Figure 2b lower left and Figure 2c).

BLE Data

BLE data can be used as best available information in areas that are Zone A's in the FIRM from approximate studies. For Region 14, BLE data is only available in the vicinity of El Paso, for the same area as the preliminary NFHL data. BLE data are quite similar to preliminary NFHL data, and the same areas are shown in Figure 3 as in Figure 1.

The Fathom data still details large, continuous floodplain running parallel to the Rio Grande (Figure 3a upper left) and north and east of El Paso (Figure 3b lower left and upper center) that are not present in the BLE data. Areas adjacent to the Rio Grande that are in the floodplain (Figure 3a lower left) are considerably less extensive and continuous than they were in the preliminary NFHL data. In these areas, the Fathom floodplain is still much narrower and less continuous, but it is closer than it was in the preliminary NFHL data. Large floodplain extents to the south and east of the city are also present in the BLE data that are considerably wider than Fathom floodplains (Figure 3b lower right and Figure 3c). The Fathom and BLE floodplains are reasonably similar in many of the smaller tributaries in this region (Figure 3a center, Figure 3b upper left, Figure 3c lower left), as they were for the preliminary NFHL data.

FAFDS Data

FAFDS flood hazard maps contain digitized flood hazard information from historical FIRMs and Flood Information Studies. For Region 14, FAFDS data are available throughout most of the planning region.

Several extensive floodplains in broad, flat basins located southwest of the Guadalupe mountains are detailed in FAFDS data for which Fathom floodplains are also present, but are considerably narrower (Figure 4a). The floodplains for the two datasets in drainage networks upslope of these basins are quite similar, but Fathom floodplains usually extend further upstream (Figure 4a lower left). In areas of Amistad's upland watershed with well-defined drainage networks, the floodplains for the two datasets are quite similar, with the Fathom floodplain being just slightly narrower (Figure 4b). Closer to Amistad, the FAFDS floodplain is considerably wider than the Fathom floodplain, but the Fathom floodplain extends farther upstream (Figure 4c).

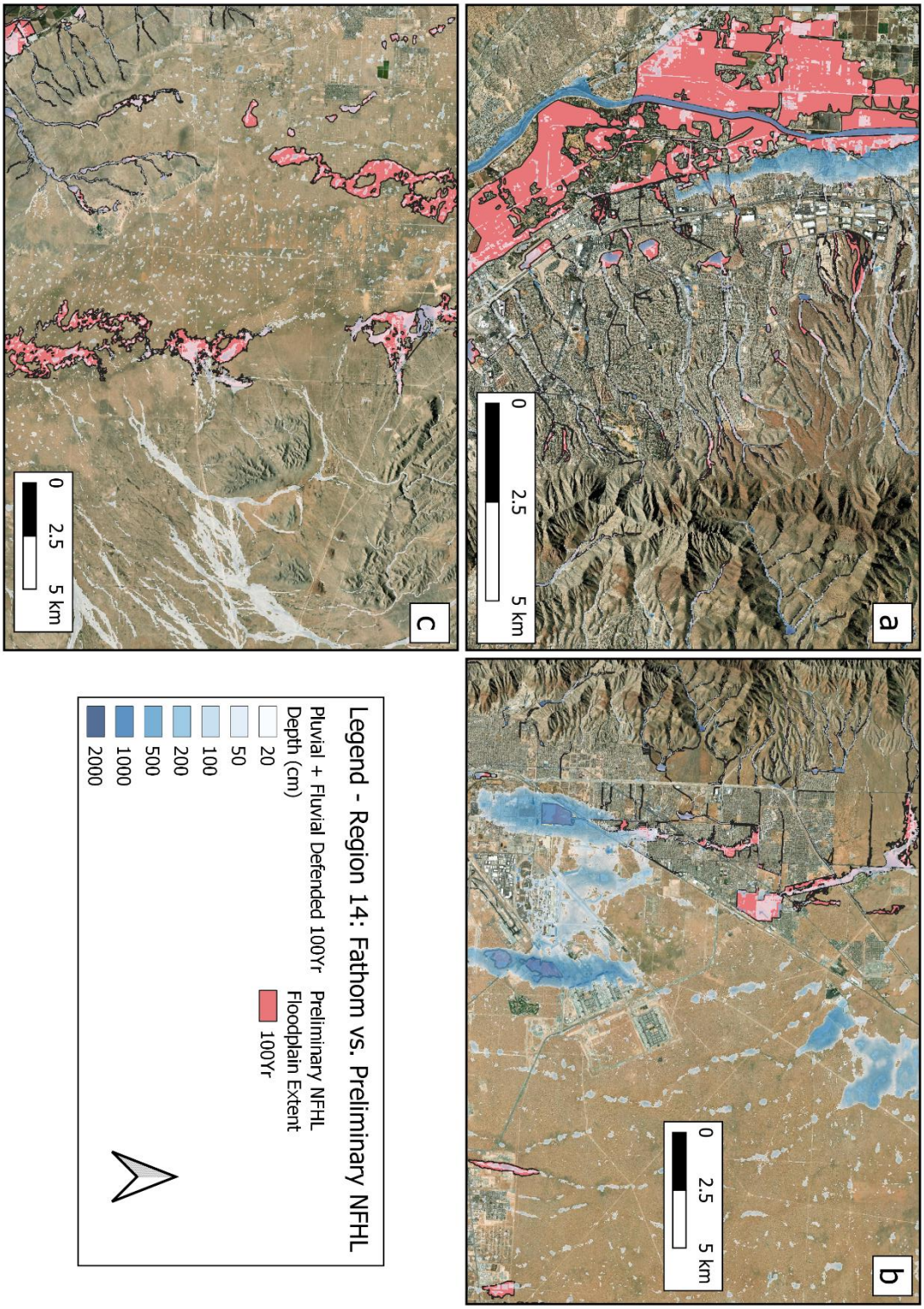

Figure 1: Comparison of Fathom floodplain with preliminary NFHL data just northwest of El Paso (a), just northeast of El Paso (b) and east of Horizon City (c).

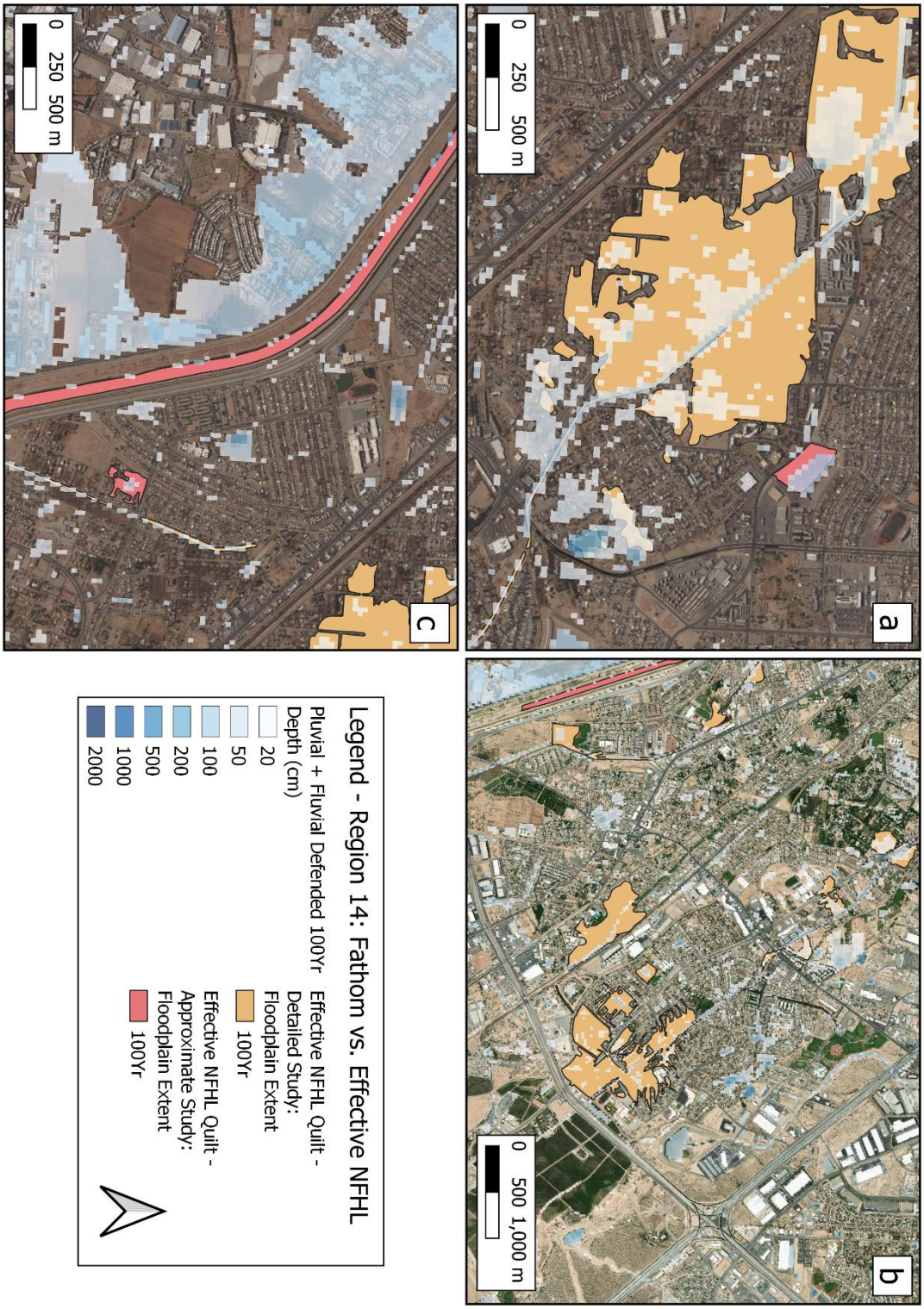

Figure 2: Comparison of Fathom floodplain with effective NFHL data just southeast of El Paso (a, b, c).

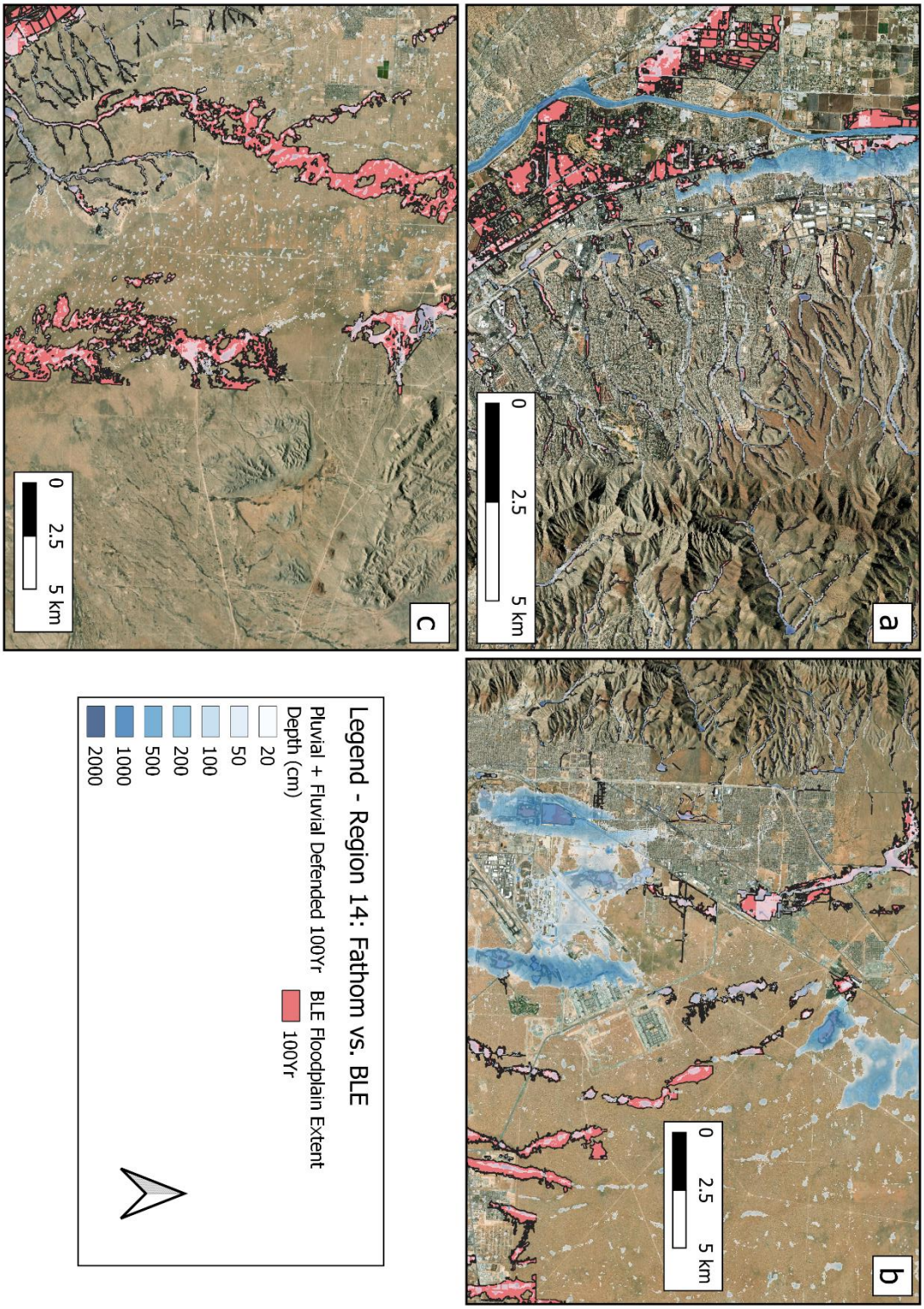

Figure 3: Comparison of Fathom floodplain with BLE data just northwest of El Paso (a), just northeast of El Paso (b) and east of Horizon City (c).

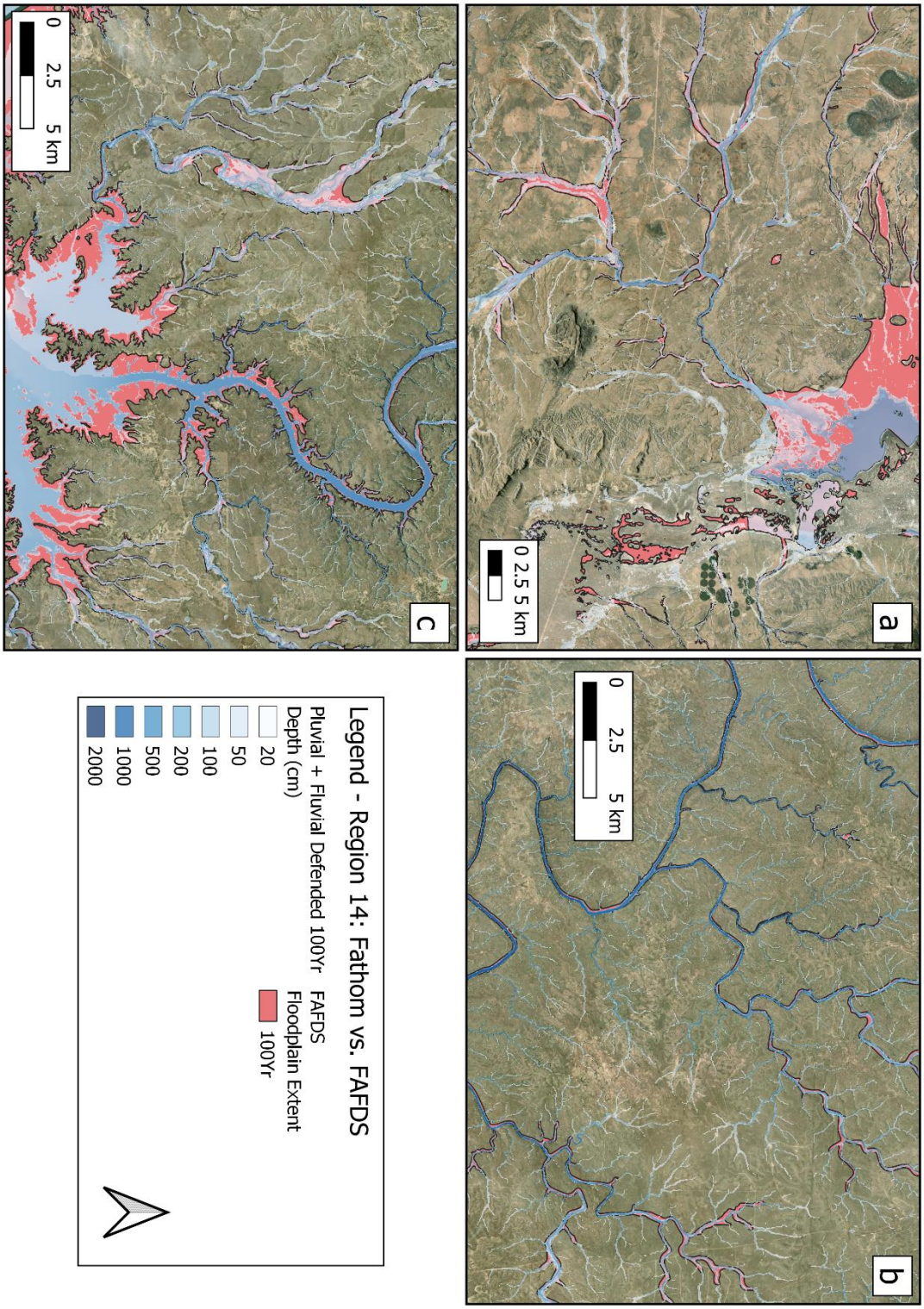

Figure 4: Comparison of Fathom floodplain with FAFDS data south of Dell City (a), northwest of Comstock (b) and at Lake Amistad (c).