

DRAFT MEMORANDUM

Date: March 30, 2023
To: LAND Steering Group
From: Sarah Reich and Jay Matonte, ECONorthwest
Re: Memorandum #3: Chehalis Basin LAND Alternative—Agriculture Impacts

Agriculture Impacts

This memorandum describes the effects of the Preliminary LAND Alternative on agricultural lands and resources in the Chehalis Basin. It begins with a summary description of these lands and resources, which is drawn from material previously documented in the Economic Baseline Technical Report and presentations to the LAND Steering Committee. It then describes the effects of the Preliminary LAND Alternative compared to conditions in the Basin without any flood reduction actions beyond what has occurred through the CFAR program. These effects are quantitatively and qualitatively described based on flood modeling of the Preliminary LAND Alternative and discussions with agricultural producers in the basin. The following summarize the major conclusions of the analysis.

- **Overall the changes in flood inundation extent, depth, and duration are relatively minor for cropland in the modeled Late Century 100-year floodplain compared to a no action alternative.**
- Inundation depth for the vast majority (99%) of agricultural lands decreases. Over two-thirds of agricultural parcels experience reductions in inundation of up to 1.5 feet. Almost a third experience reductions in inundation depth greater than 1.5 feet. Most of these parcels would still flood and potential value crop loss would depend on the timing of flooding.
- Duration of flood inundation change—how long an agricultural parcel is underwater—varies across the study area but the overall changes are insignificant.
- The Preliminary LAND Alternative slightly increases the number of acres of cropland in the floodplain under the modeled Late Century 100-year flood: up to 580 or two percent more acres would be inundated (an increase from 32,461 acres to 33,041 acres) compared to a no action alternative.
- The relationship between agricultural production value and changes in inundation extent and depth in the Late Century 100-year floodplain are difficult to predict. The increase in acres in the floodplain could result in a small increase in potential crop loss or at risk of loss. The current value associated with newly inundated acres (potentially at risk) is about \$500,000. Reductions

in inundation depth could potentially result in decreases in the risk of crop loss on some parcels, but these changes are impossible to predict with the currently available modeled data.

- Flood inundation is associated with debris deposition, which can be a major cost to agricultural landowners. Reductions in inundation depth could reduce debris deposition for some parcels. The Preliminary LAND Alternative could also include investments in debris fencing, which is a common element of Aquatic Species Restoration Plan (ASRP) projects (restoration actions under LAND will align with ASRP objectives). Debris fencing could reduce current costs to landowners during lower magnitude flood events, and mitigate potential costs associated where flood inundation increases.
- Ongoing flooding under the Preliminary LAND Alternative will continue to support productivity of agricultural lands in the floodplain through alluvial deposition. The value of this productivity varies by location and duration across the basin and by flood event. In some cases, alluvial deposits kill perennial crops resulting in short-term costs. In other cases, alluvial deposits can increase crop productivity for several years following a flood. Although most farmers no longer depend on flooding for nutrient input and management, if incorporated in crop management it could reduce other nutrient inputs and costs or enhance productivity on agricultural lands that are not intensively cultivated, such as pastures.
- The Preliminary LAND Alternative is assumed to continue existing programs to support development of livestock refugia and agricultural pads where needed throughout the basin, as floodwaters will remain relatively unchanged for most agricultural land within the floodplain. Demand for agricultural pads has diminished as previous implementation efforts in the Basin have provided pads to those interested in receiving them.
- The Preliminary LAND Alternative is not expected to meaningfully affect the market for agricultural land or crops, as it does not change agricultural land zoning, land use development policy on agricultural land, or demand for agricultural goods and services.

Current Extent and Value of Agriculture in the Chehalis Basin

Cropland and animal production both occur in the Chehalis Basin and are impacted by flooding. Flood impacts to animal production have been large in recent flood events, leading to investments in livestock refugia (livestock pads) throughout the basin—these investments are expected to continue under current conditions and the Preliminary LAND Alternative. Therefore, this analysis focuses on flooding impacts to cropland.

Cropland

In total there are almost 150,000 acres in the five-county area surrounding the Chehalis Basin. About half of those acres (78,867 acres) are located in the Chehalis Basin (Figure 1), and about 40 percent of

those acres (32,461 acres) are located in the current floodplain of the Chehalis and Skookumchuck Rivers and tributaries (Figure 2).

Over 80 percent of the cropland in the Chehalis Basin is hay/silage or pasture (Table 1). The same is true of the Late Century 2080 100-year floodplain (Table 3). Cereal grain is the next largest crop type in both the basin and the floodplain area. The floodplain contains about half of all of the hay/silage acreage in the basin, about a quarter of all of the nursery stock, and almost 90 percent of all cereal grain acreage (Table 3).

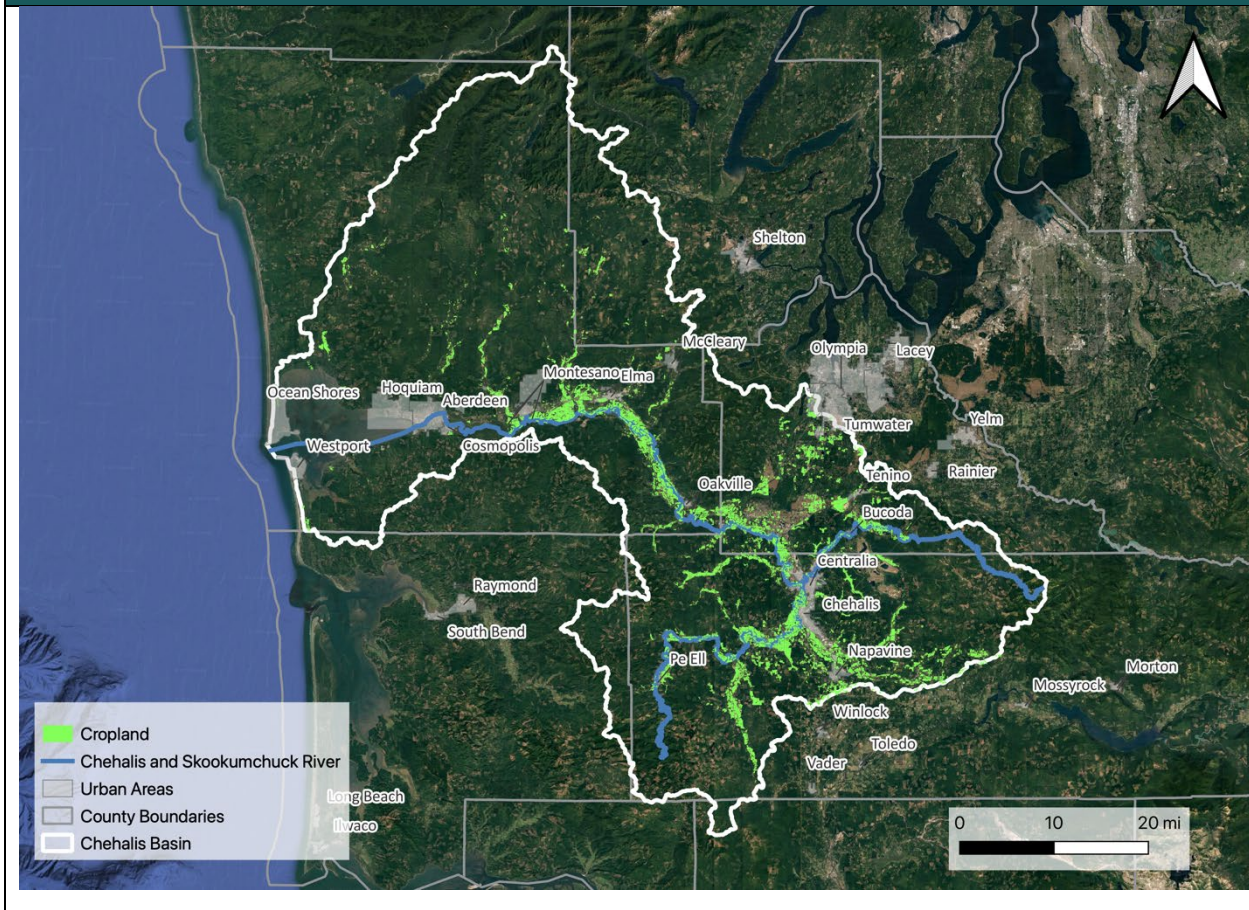
Cropland Value

Crop production in the Chehalis Basin is worth about \$87 million per year (Table 2).¹ Of the \$87 million, \$38 million, or 44 percent, is nursery and flower bulb. This is the highest valued crop in the Chehalis Basin both in terms of per-acre value and total value. High-value crops (crops producing more than \$2,000 per acre on average) in the Chehalis Basin include nursery stock (approximately \$50,000/acre), blueberries (approximately \$3,000/acre), and vegetable seed (approximately \$3,000/acre). Pastureland and hay/silage are the lowest value crops per acre but because they make up most crop acres, they have the second and third greatest aggregate value.

Cropland within current 100-year floodplain produces about 32 percent of the estimated annual value of crop production in the Chehalis Basin (compared to representing about 40 percent of the total acreage); therefore, on average the value per acre produced within the floodplain is somewhat lower than the value per acre outside of the floodplain (Table 4). Like the Basin as a whole, nursery and flower bulbs is the highest value crop in the aggregate within the floodplain, although just as in the entire basin, pasture and hay/silage are the second and third highest value crops in the floodplain, together exceeding nursery and flower bulbs. Due to the high value and high cultivation density of nursery crops, small increases in nursery crop land inundated results in disproportionately large impacts to value of crops inside flood inundated land.

¹ A complete description of the methodology and data used to calculate this are in the Economic Baseline Technical Memorandum.

Figure 1
Cropland in the Chehalis Basin



Source: MIG, WSDA, Google

Table 1: Cropland Acreage in the Chehalis Basin by Crop Type

AGRICULTURAL COMMODITY	GRAYS HARBOR	LEWIS	MASON	PACIFIC	THURSTON	TOTAL
Nursery & Flower Bulb	170	102	0	0	482	755
Orchard	5	70	0	0	2	76
Berry	326	615	0	0	78	1,019
Vegetable & Seed	230	170	0	0	420	820
Cereal Grain & Oilseed	2,408	840	0	0	89	3,337
Commercial Tree	459	2,444	22	0	817	3,742
Pastureland	8,672	13,013	634	2	9,019	31,340
Hay/Silage & Other	11,297	20,029	333	0	6,118	37,777
Total	23,566	37,284	990	2	17,025	78,867

Source: Washington State Department of Agriculture 2022

Notes: "Commercial Tree" includes Christmas tree production "Hay/Silage & Other" includes hay/silage, other,

turfgrass, and green manure. “Other” is not defined in raw data but independent comparison of satellite imagery indicated they appeared to be similar to pasture/silage. They represent a small percentage of this category.

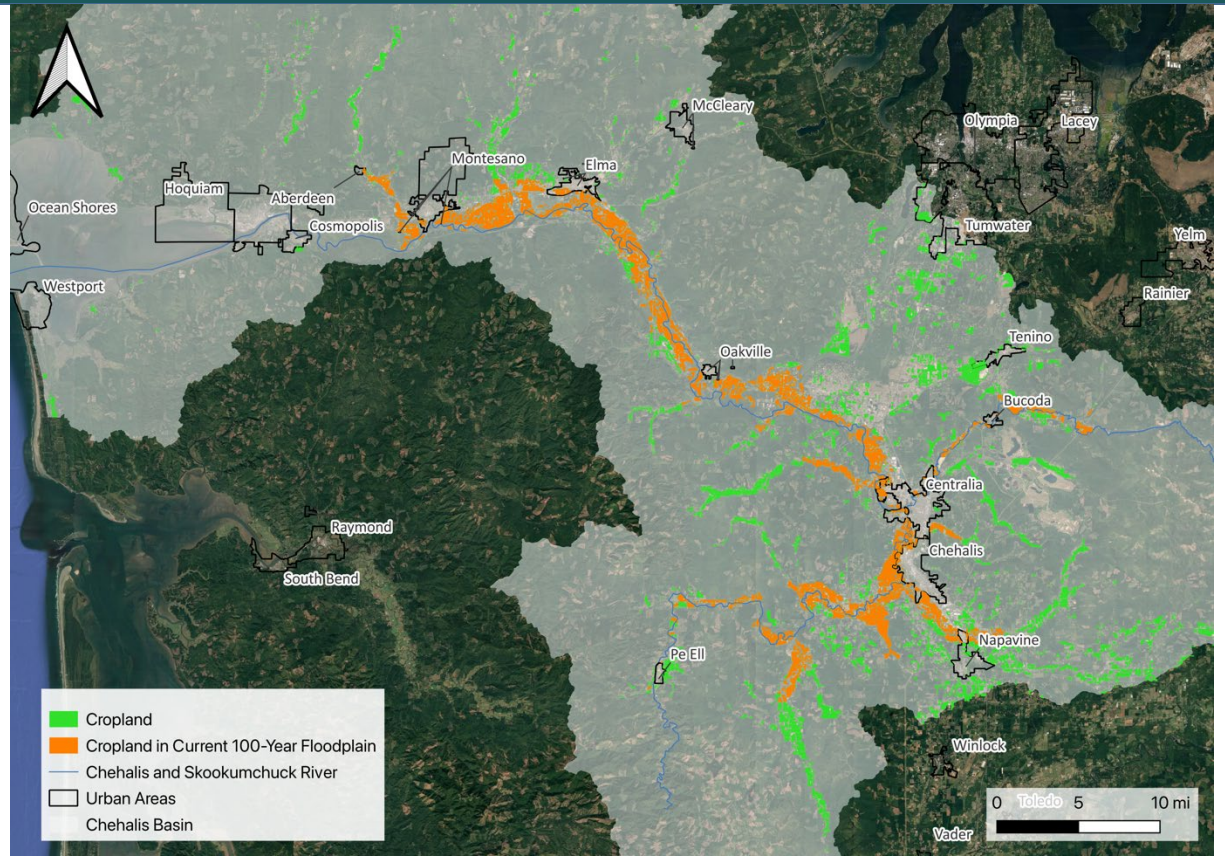
Table 2: Estimated Value of Cropland in the Chehalis Basin

AGRICULTURAL COMMODITY	GRAYS HARBOR	LEWIS	MASON	PACIFIC	THURSTON	TOTAL
Nursery & Flower Bulb	\$8,616,807	\$5,156,851	-	-	\$24,391,037	\$38,164,695
Orchard	\$59,615	\$922,172	-	-	\$29,110	\$1,010,897
Berry	\$1,060,454	\$1,999,519	-	-	\$253,951	\$3,313,924
Vegetable & Seed	\$622,930	\$482,056	-	-	\$1,171,153	\$2,276,139
Cereal Grain & Oilseed	\$3,298,726	\$1,151,278	-	-	\$122,370	\$4,572,374
Commercial Tree	\$454,746	\$2,422,021	\$22,022	-	\$809,813	\$3,708,602
Pastureland	\$7,110,886	\$10,670,999	\$520,042	\$1,973	\$7,395,246	\$25,699,147
Hay/Silage & Other	\$2,622,226	\$4,718,409	\$79,293	-	\$1,434,935	\$8,854,864
Total	\$23,846,390	\$27,523,305	\$621,357	\$1,973	\$35,607,615	\$87,600,642

Source: ECONorthwest analysis with data from United States Department of Agriculture 2021, Washington State Department of Agriculture 2022

Figure 2

Cropland in the Current 100-Year Modeled Floodplain



Source: MIG, WSDA, Google

Table 3 illustrates the acreage of cropland inside the current 100-year floodplain by county and agricultural commodity. The final column, percent of total basin crop, shows what percentage of that agricultural commodity for the entire basin is within the floodplain. The agricultural commodity with the higher percentage of its acreage in the floodplain for the Chehalis Basin is Cereal Grains & Oilseed. The expansion of cereal grains in the Chehalis Basin is a key agriculture regional strategy and local producers and local governments have taken steps to further develop local markets and invest in specialized grain transportation logistics.

Table 3: Cropland Inside the Current 100-Year Floodplain of Chehalis and Skookumchuck Rivers, Chehalis Basin

AGRICULTURAL COMMODITY	GRAYS HARBOR	LEWIS	THURSTON	TOTAL	PERCENT OF TOTAL BASIN CROPS
Nursery & Flower Bulb	132	68	2	202	26.8%
Orchard	4	56	2	62	81.1%

Berry	8	126	67	201	19.7%
Vegetable & Seed	216	148	199	563	68.7%
Cereal Grain & Oilseed	2,292	646	42	2,980	89.3%
Commercial Tree	285	310	159	754	20.1%
Pastureland	3,436	3,543	1,995	8,974	28.6%
Hay/Silage & Other	7,486	8,691	2,548	18,725	49.6%
Total	13,859	13,588	5,014	32,461	41.2%

Source: Washington State Department of Agriculture

Table 4 shows what percentage of Chehalis Basin agricultural commodity estimated value is within the floodplain for the current 100-year floodplain. The three commodities with the greatest estimated value in the floodplain are cereal grain & oilseed, vegetable and vegetable seed, and hay/silage & other.

Table 4: Estimated Cropland Value Inside the Current 100-Year Modeled Floodplain

AGRICULTURAL COMMODITY	GRAYS HARBOR	LEWIS	THURSTON	TOTAL	PERCENT OF TOTAL BASIN CROPS
Nursery & Flower Bulb	\$101,150	\$3,439,114	\$5,006,945	\$8,547,210	22%
Orchard	\$26,448	\$740,544	\$52,896	\$819,888	22%
Berry	\$217,818	\$409,628	\$26,008	\$653,454	20%
Vegetable & Seed	\$563,790	\$419,301	\$606,287	\$1,589,379	70%
Cereal Grain & Oilseed	\$57,538	\$884,992	\$3,139,942	\$4,082,472	89%
Commercial Tree	\$157,520	\$307,114	\$282,347	\$746,981	20%
Pastureland	\$1,635,900	\$2,905,260	\$2,817,520	\$7,358,680	29%
Hay/Silage & Other	\$606,424	\$2,021,096	\$1,761,438	\$4,388,958	50%
Total	\$3,366,589	\$11,127,050	13,696,383	\$28,187,022	32%

Source: ECONorthwest analysis with data from United States Department of Agriculture 2021, Washington State Department of Agriculture 2022

Agriculture Impacts of the Preliminary LAND Alternative

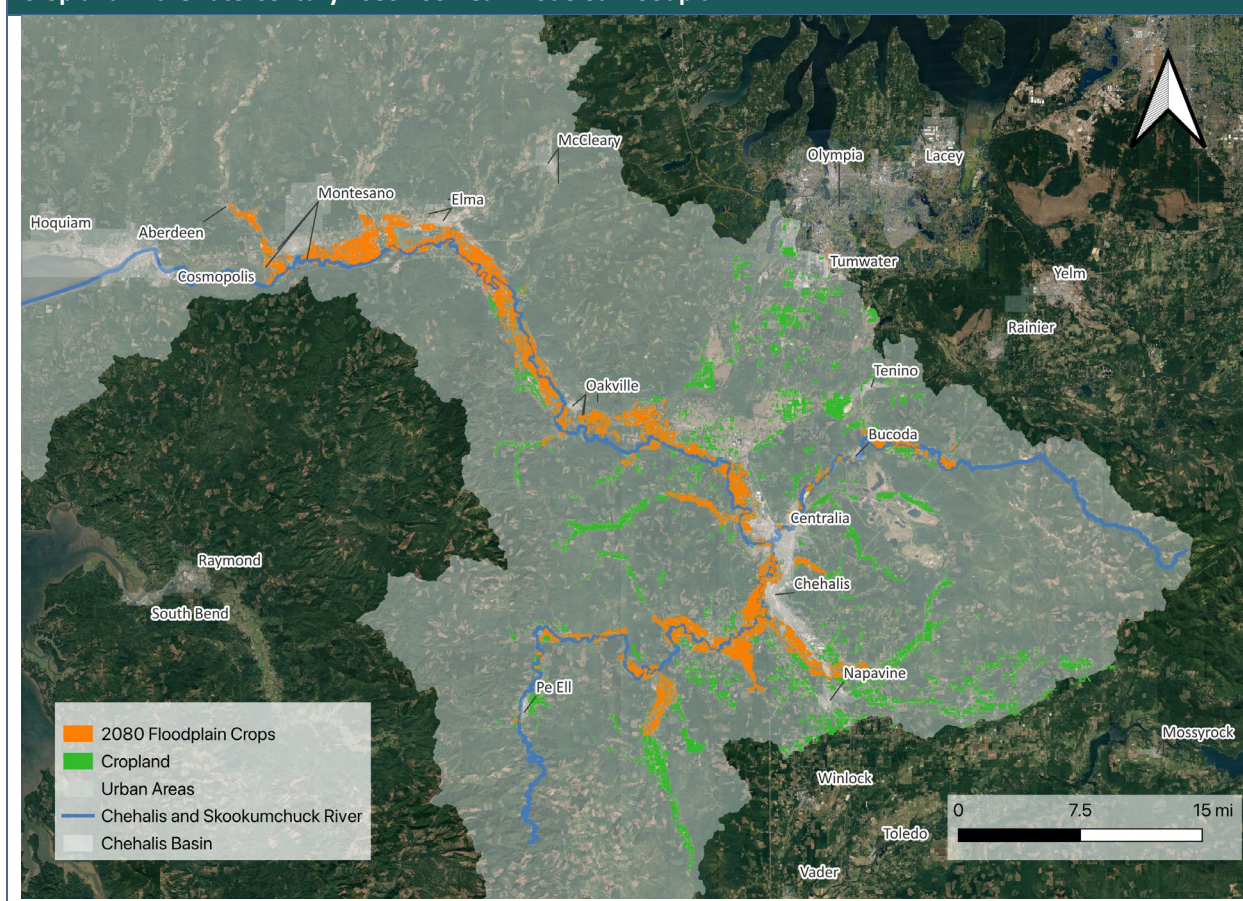
Cropland

Under the Preliminary LAND Alternative, the changes in flood inundation extent, depth, and duration are relatively minor (positive or negative) for cropland in the modeled Late Century 2080 100-year floodplain (shown in relation to agricultural land in Figure 3).

- The Preliminary LAND Alternative increases the extent of cropland inundation in the Late Century 2080 100-year floodplain by 2 percent or up to 580 acres, from 32,461 to 33,041 acres (Table 5).

- Inundation depth for the vast majority (99%) of agricultural lands decreases (Figure 4). Over 46 percent of acres in the floodplain experience a one-foot decrease in depth and 37 percent of acres experience at least a one foot decrease in depth. About 57 acres experience an increase in depth. A little over 15 percent of agricultural acres experience no change in inundation depth.
- The Preliminary LAND Alternative changes the duration of flooding in sampled areas within the modeled floodplain by a small amount which would be materially insignificant from a flood risk/damage perspective.

Figure 3
Cropland in the Late-Century 2080 100-Year Modeled Floodplain



Source: MIG, WSDA, Google

Table 5: Change in Cropland Floodwater Inundation Extent by Crop Type Under Preliminary LAND Alternative

CROP TYPE	CURRENT (ACRES)	PRELIMINARY LAND ALTERNATIVE (ACRES)	DIFFERENCE (ACRES)	PERCENT DIFFERENCE ¹
Nursery & Flower Bulb	202	208	6	2%

Orchard	62	62	0	0%
Berry	201	201	0	0%
Vegetable & Seed	563	575	12	2%
Cereal Grain & Oilseed	2,980	2,959	-21	-1%
Commercial Tree	754	773	19	3%
Pastureland	8,974	9,221	247	3%
Hay/Silage & Other ²	18,725	19,043	318	2%
Total	32,461	33,041	580	2%

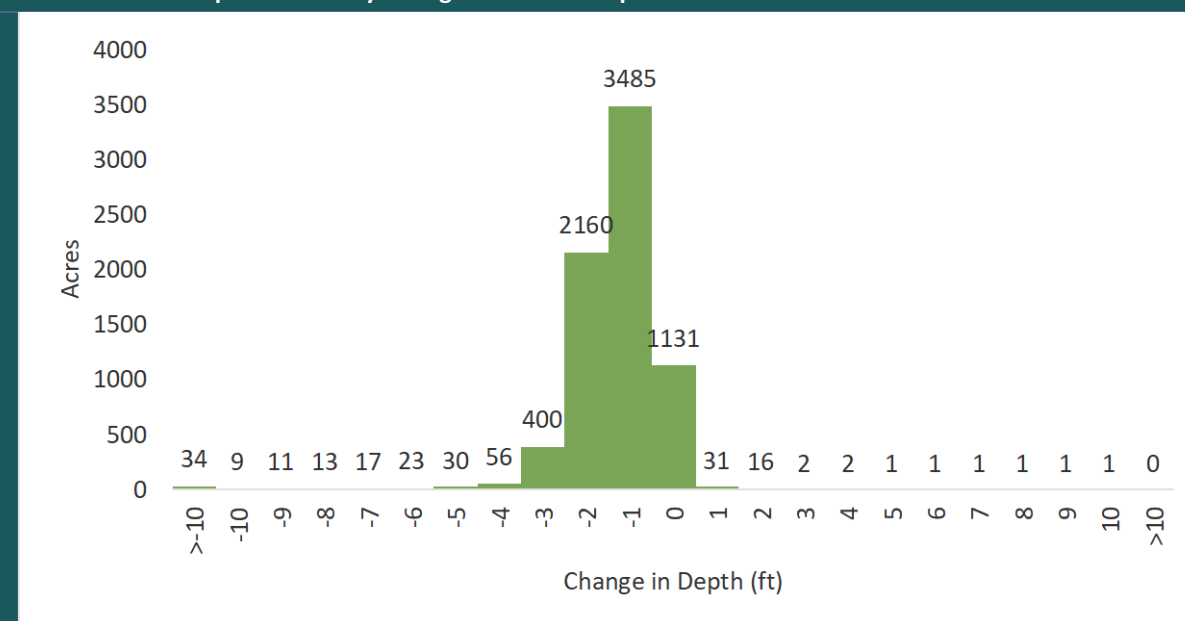
Source: Washington State Department of Agriculture 2022, MIG

Notes:

¹ Positive values represent increases in acreage within the flood inundation area, which means it is potentially at risk during a flood event. Negative values represent crop acreage that is removed from the inundation area and would not be at risk for future flooding.

Figure 4

Distribution of Cropland Acres by Change in Median Depth of Flood Inundation



Source: ECONorthwest analysis with data from MIG

Changes in Cropland Value

The Preliminary LAND Alternative will likely have a minor impact for cropland production and value in the Chehalis Basin. For most landowners the changes in inundation extent, depth, and duration are

unlikely to make a meaningful difference in realized crop value (or crop loss) especially considering annual fluctuations in cropping patterns, productivity, and market value. Reductions in inundation depth could potentially result in decreases in the risk of crop loss and value on some parcels, but these changes are impossible to predict with the currently available modeled data.

Table 6 shows the value associated with land within the current floodplain and the Late-Century 2080 100-year floodplain. As described in the previous section, the acres within the floodplain increase slightly over current conditions. Therefore, the value of crops within the floodplain—and thus the value potentially at risk of flood impact—also increases. Almost 50 percent of the change in value (about \$500,000) is associated with the 6 acres of Nursery and Flower Bulb that shift into the floodplain, because the per-acre value is so much higher for that crop than other crop types. The value of the almost 250 acres of pastureland shifting into the floodplain accounts for 36 percent of the total value.

While the Preliminary LAND Alternative focuses on addressing the impacts of flooding from the Late Century 2080 100-year modeled flood event, the Preliminary LAND Alternative also assumes restoration of the floodplain that is aligned with the ASRP goals within the Chehalis Basin. In addition to restoration, localized flood and debris management could also include flood fencing and other non-structural flood damage reduction interventions to reduce flooding impacts to farmland during smaller and more frequent events. Existing agricultural practices are assumed to continue on those parcels, to the greatest degree possible.

Table 6: Estimated Value Associated with Cropland Inundation under Current Conditions and Preliminary LAND Alternative (Increase means more inundation, Decrease means less inundation)

CROP TYPE	CURRENT VALUE (THOUSANDS)	PRELIMINARY LAND ALTERNATIVE VALUE (THOUSANDS)	DIFFERENCE (THOUSANDS)	PERCENT DIFFERENCE ¹	PERCENT OF TOTAL
Nursery & Flower Bulb	\$10,216	\$10,489	\$273	3%	48%
Orchard	\$820	\$818	-\$2	~0%	0%
Berry	\$653	\$655	\$2	~0%	0%
Vegetable & Seed	\$1,589	\$1,622	\$33	2%	6%
Cereal Grain & Oilseed	\$4,082	\$4,053	-\$29	<-1%	-5%
Commercial Tree	\$747	\$766	\$19	2.5%	3%
Pastureland	\$7,359	\$7,561	\$202	3%	36%
Hay/Silage & Other ²	\$4,389	\$4,455	\$66	1.5%	12%
Total	\$29,855	\$30,418	\$563	2%	100%

Source: ECONorthwest analysis with data from United States Department of Agriculture 2021, Washington State Department of Agriculture 2022

Notes: ¹ Positive values represent increases in acreage within the flood inundation area, which means it is potentially at risk during a flood event. Negative values represent crop acreage that is removed from the inundation area and would not be at risk for future flooding.

²“Hay/Silage & Other” includes hay/silage, other, turfgrass, and green manure. Other” is not defined in raw data but independent comparison of satellite imagery indicated they appeared to be similar to pasture/silage. They represent a small percentage of this category.

Changes in Flood Cleanup Costs

Flooding produces other costs for agricultural producers, including costs to remove debris and potential waterborne contamination. The Preliminary LAND Alternative would include funding to continue voluntary installations of debris fencing and non-structural flood management interventions. Compared to current resources available the Preliminary LAND Alternative may increase the availability of funding for fencing projects compared to current resources. Expanding fencing is unlikely to make a significant difference in the Late Century 2080 100-year modeled flood because it is likely to overwhelm any protection fencing provides. It may, however, reduce the post-flood cleanup costs for smaller flood events in some areas. Reducing flood inundation risk of structures in the floodplain through the Safe Structures Program and constructed flood control measures may reduce the risk of floodwaters becoming contaminated and adversely impacting agricultural land.

Potential Benefits of the Preliminary LAND Alternative for Agriculture

The Preliminary LAND Alternative has the potential to produce benefits for agricultural producers and landowners in several ways:

- Some agricultural land would be eligible for **voluntary restoration and non-structural flood management** that helps mitigate smaller floods. Depending on how the program is designed, participation may involve economic incentives for landowners and may be compatible with certain crop production practices. Participation in the program could replace or expand the stream of revenue from agricultural land for some producers, while also producing ecosystem service benefits for residents in the Chehalis Basin.
- Recurrent flooding patterns under the Preliminary LAND Alternative would continue to support **alluvial transport and deposition** throughout the floodplain. Some producers can benefit from the increased nutrients that come with deposition, especially in smaller more frequent flood events. Although most farmers no longer depend on flooding for nutrient input and management, if incorporated in crop management alluvial deposition could reduce other nutrient inputs and costs or enhance productivity on agricultural lands that are not intensively cultivated, such as pastures. However, flooding also produces costs for some agricultural producers in the form of soil loss from erosion and crop loss from deposition, especially in larger flood events like the Late Century 2080 100-year modeled flood. These benefits (and costs) can be very localized and specific to the nature of individual flood events. The benefits from an individual flood event tend to be relatively short-lived (growers may see an increase in

productivity for a few years following a flood). Costs may be short-lived as well (i.e., crop losses from a single season), although longer-term costs may occur from the loss of productive land from erosion following a major flood.

Other Implementation Considerations for Agricultural Land

As the banks of the river change from restoration efforts and levee construction, it is imperative that access to the river for water withdrawal is made unimpeded for agricultural practices. Farmers who withdrawal directly from the river will need to be able to put pump inlets directly into the river to acquire water. This requires both stable and accessible riverbanks, as well as minimal sediment and debris introduced upstream from land use practices that could damage pumps during the irrigation season.

The Preliminary LAND Alternative will not directly change local zoning or growth management regulations. Currently designated agricultural land will remain constrained to agricultural uses. Thus, any impacts the Preliminary LAND Alternative may have on other land uses (e.g., for residential housing) are not expected to affect the market (supply, demand, or value) for land zoned for agriculture. Other factors that may influence the value of agricultural land, including the current or future market value for crops and livestock or the availability of water rights, are also not expected to change as a direct result of the Preliminary LAND Alternative.