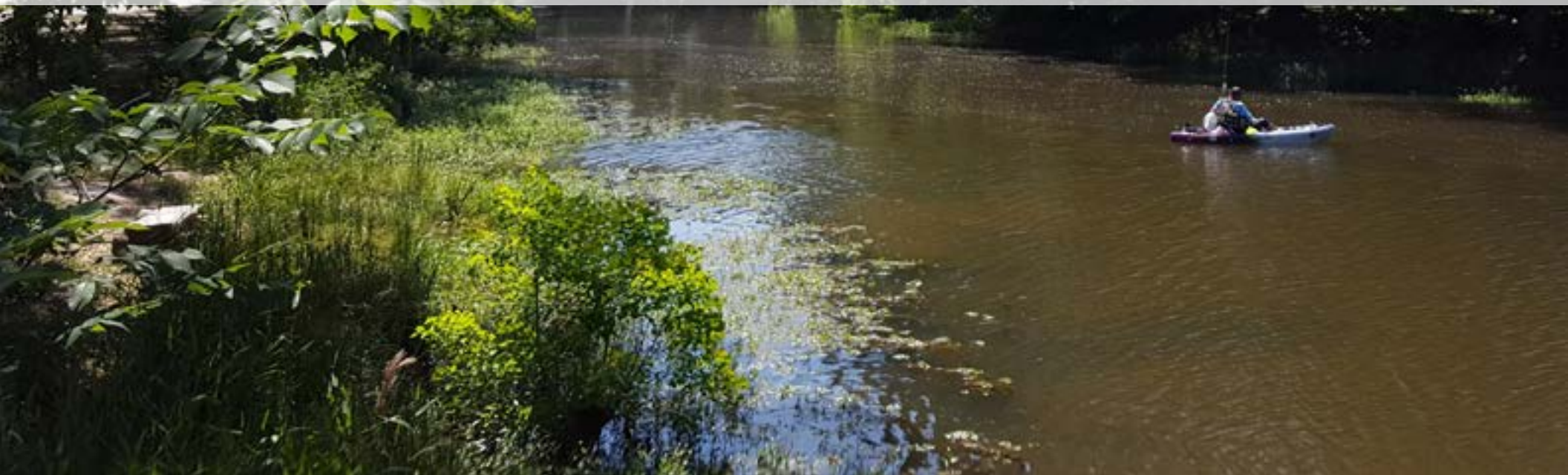
Ecosystem Service Benefits

Natural areas and landscapes provide valuable services to communities, including reducing flood impacts, filtering pollution from water and air, and improving residents' quality of life.



Ecosystem Service Benefits by Practice and Land Cover Type

In addition to their value as wildlife habitat, forests, prairies, and wetlands provide flood protection, air and water quality improvement, carbon sequestration, and water supply regulation—all fundamental to the wellbeing and quality of life of residents and visitors to the region. Different types of natural areas yield differing types and levels of benefits as shown in Tables 1 and Table 2.

Table 1. Ecosystem Service Benefits by Practice for H-GAC Region

Conservation Goal	Potential Practice	Flood and Disaster Mitigation	Economy	Carbon, Energy or Heat	Quality of Life/ Health	Environmental Quality	Recreation	Habitat
Preserve existing natural areas	Acquisition; conservation easements	P	S	P	S	P	P	P
Restore natural areas	Replanting; remove invasives	P		S	P	S		
Restore streamside areas	Planting; Restoring; erosion control	P	S	S	P	P	S	S
Expand urban tree canopy	Planting; ordinances	S		P	P	P		S
Implement LID	Construct; Provide incentives	P		P		P		
Maintain or expand wetlands	Protect existing; construct; mitigation banking	P	S	S		P		S
Preserve prime soils	Agricultural /erosion best practices	S	P			S		
Develop natural recreation areas	Park / amenity development; natural areas in existing parks		P		P		P	
Build conservation into planning	Ordinances; offer incentives; develop plans	P	P	S	P	S	P	S

Ecosystem Service Benefits (P = primary benefit, S= Secondary benefit)

Table 1. Ecosystem Service Benefits by Practice for H-GAC Region (Continued)

Conservation Goal	Potential Practice	Flood and Disaster Mitigation	Economy	Carbon, Energy or Heat	Quality of Life/ Health	Environmental Quality	Recreation	Habitat
Promote nature tourism	Marketing; develop amenities		P		S		P	S
Promote resident conservation	Education / outreach, incentive programs	S	S	S	P	S	S	
Source water protection	Ordinances; development rights	S	P		P	P		
Promote habitat	Pollinator/bird habitat development		P		S		P	P
Ecosystem Service Benefits (P = primary benefit, S= Secondary benefit)								

Table 2. Ecosystem Service Benefits by Land Cover Type for H-GAC Region

Ecological Asset	Flood and Disaster Mitigation	Economy	Carbon, Energy or Heat	Quality of Life/ Health	Environmental Quality	Recreation	Habitat
Undeveloped Forests	P		P	S	P	S	P
Urban Tree Canopy	P	S	P	P	P	S	S
Wetlands	P	S	S	S	P	S	P
Prairie and Grasslands	P	S	S	S	P	S	P
Agricultural Lands	S	P		S			
Urban Open Space	S	S	S	P	S	P	S
Healthy Waterways	S	S		S	P	S	P
Clean Air		S	P	P	P		
Ecosystem Service Benefits (P = primary benefit, S= Secondary benefit)							

Ecosystem Service Monetary Values for the Houston-Galveston Region

While the benefits of forests, prairies, and wetlands exceed monetary value, the dollars and cents make a compelling case. Tables 3 and 4 show the estimated value of each ecosystem service using the acreage of each ecological land type in region.

Table 3. Ecosystem Service Monetary Values for H-GAC Region

Ecosystem Service	Ecological Land Type	Area Acres in H-GAC 13-county region	Average $ Value in 2021 (per acre per year)	$ Value for the region in 2021
Water Supply	Forest all	2,546,611	243	$618,826,478
	Prairies all	1,604,290	243	$389,842,362
	Nontidal Wetlands	252,692	11,667	$2,948,157,396
Flood Protection	Forest all	2,546,611	363	$924,419,800
	Nontidal Wetlands	252,692	10,003	$2,527,677,932
	Tidal Wetlands	212,330	4783	$1,015,576,120
	Prairie Class 1	21,508	363	$7,807,300
Carbon Sequestration	Upland Forest	1,637,093	147	$240,652,689
	Bottomland Forest	909,518	150	$136,427,684
	Wetlands All	465,022	143	$66,498,196
	Prairies Class 1-3	39,194	71	$2,782,742
Water Quality	Upland Forest	1,637,093	235	$384,716,884
	Bottomland Forest	909,518	332	$302,069,515
	Nontidal Wetlands	252,692	830	$209,653,596
	Tidal Wetlands	212,330	612	$129,848,775
	Prairies all	1,604,290	330	$529,207,885
Air Quality	Forest all	2,546,611	391	$995,724,908

H-GAC adjusted valuations from Conservation Fund and U.S. Fish and Wildlife data. August 2021.

How are values estimated?

Ecosystem service values are estimated by comparing equivalent values for benefits or avoided costs. The average value of an acre of each land type was adjusted from Conservation Fund and U.S. Fish and Wildlife data to reflect inflation and land use in August 2021. More information in Appendix A.

Examples Sentences

- All 2.5 million acres of forest in the Houston-Galveston region provided an estimated $995,724,908 in human health benefits by improving air quality.
- Wetlands in the Houston-Galveston region are especially effective at absorbing stormwater. They provided over $3 billion in flood protection services that would otherwise have to be performed by engineered stormwater facilities.

Table 4. Ecosystem Service Benefits by H-GAC County

Ecosystem Service	Ecological Land Type	Austin	Brazoria	Chambers	Colorado	Fort Bend	Galveston
Flood Protection	Forest all	$33,652,078	$72,752,774	$14,900,767	$57,978,876	$29,715,935	$7,184,491
	Prairies all	$21,313,882	$60,732,504	$21,843,570	$34,216,300	$32,286,322	$16,423,991
	Nontidal Wetlands	$225,517,539	$156,152,412	$126,126,822	$264,536,676	$92,191,476	$148,620
Water Supply	Forest all	$50,270,388	$108,680,069	$22,259,170	$86,610,419	$44,390,471	$10,732,388
	Nontidal Wetlands	$193,353,214	$133,881,252	$108,138,048	$226,807,265	$79,042,713	$127,423
	Tidal Wetlands	$0	$314,696,970	$266,246,063	$91,047	$54,870	$178,895,805
Carbon Sequestration	Upland Forest	$14,448,298	$11,904,258	$6,599,453	$28,710,213	$6,251,700	$4,289,306
	Bottomland Forest	$6,029,727	$32,761,917	$2,463,869	$6,493,293	$11,963,884	$58,028
	Wetlands All	$2,764,122	$11,322,597	$9,506,016	$3,245,093	$1,131,612	$5,350,369
Water Quality	Upland Forest	$23,097,619	$19,030,617	$10,550,146	$45,897,280	$9,994,214	$6,857,054
	Bottomland Forest	$13,345,795	$72,513,043	$5,453,362	$14,371,823	$26,480,063	$128,436
	Nontidal Wetlands	$16,043,504	$11,108,811	$8,972,766	$18,819,357	$6,558,578	$10,573
	Tidal Wetlands	$0	$40,266,474	$34,067,027	$11,650	$7,021	$22,890,285
	Prairies all	$28,944,778	$82,476,240	$29,664,107	$46,466,580	$43,845,623	$22,304,185
Air Quality	Forest all	$54,147,993	$117,063,105	$23,976,131	$93,291,113	$47,814,529	$11,560,230
$ value for ecosystem services, by county							

Example Sentence

- Austin County has 138,486 acres of forest, which provided an estimated $54,147,993 in human health benefits last year by improving air quality.

Table 4. Ecosystem Service Benefits by H-GAC County (Continued)

Ecosystem Service	Ecological Land Type	Harris	Liberty	Matagorda	Montgomery	Walker	Waller	Wharton
Flood Protection	Forest all	$39,761,851	$98,164,455	$48,034,952	$85,147,118	$75,183,878	$21,382,752	$35,360,676
	Prairies all	$24,875,830	$19,860,691	$68,820,198	$1,785,422	$5,339,771	$23,670,987	$59,325,647
	Nontidal Wetlands	$84,047,084	$830,488,594	$131,521,564	$341,681,669	$470,792,821	$104,042,817	$121,778,431
Water Supply	Forest all	$59,397,333	$146,640,728	$71,755,916	$127,195,078	$112,311,719	$31,942,136	$52,822,738
	Nontidal Wetlands	$72,059,911	$712,040,576	$112,763,367	$292,949,493	$403,646,232	$89,203,763	$104,409,844
	Tidal Wetlands	$3,508,691	$0	$248,585,477	$0	$0	$0	$182,641
Carbon Sequestration	Upland Forest	$15,790,359	$36,486,922	$13,869,715	$40,248,503	$42,263,593	$8,825,231	$11,076,863
	Bottomland Forest	$8,431,741	$23,363,789	$15,498,435	$11,490,049	$3,283,686	$4,193,893	$10,524,656
	Wetlands All	$1,135,049	$10,179,127	$9,044,130	$4,187,921	$5,770,410	$1,275,231	$1,498,073
Water Quality	Upland Forest	$25,243,091	$58,329,434	$22,172,673	$64,342,844	$67,564,247	$14,108,362	$17,707,911
	Bottomland Forest	$18,662,253	$51,711,853	$34,303,202	$25,431,308	$7,267,892	$9,282,482	$23,294,571
	Nontidal Wetlands	$5,979,179	$59,081,643	$9,356,553	$24,307,516	$33,492,589	$7,401,692	$8,663,418
	Tidal Wetlands	$448,948	$0	$31,807,299	$0	$0	$0	$23,369
	Prairies all	$33,781,992	$26,971,309	$93,459,528	$2,424,647	$7,251,541	$32,145,784	$80,565,693
Air Quality	Forest all	$63,978,945	$157,951,859	$77,290,808	$137,006,268	$120,974,882	$34,405,993	$56,897,219
$ value for ecosystem services, by county								

Example Sentence

- Nontidal wetlands in Walker County are important protection from storm surge and effective at absorbing stormwater. They provided nearly $471 million in flood protection services that would otherwise have to be performed by engineered stormwater facilities.

Appendix A

Ecosystem service values are estimated by cost-based comparisons to human-engineered solutions (e.g. stormwater basins) or avoided damages (e.g. hurricane surges reduced by coastal wetlands). The average value of an acre of each land type was adjusted from Conservation Fund and U.S. Fish and Wildlife data to reflect inflation and current land use in August 2021.

Ecosystem Service	Benefit Evaluated	How is the benefit estimated?
Water Supply	Forests, wetlands, and prairies retain rainfall, ensuring a steady supply of groundwater. Paved surfaces in developed areas rapidly direct water away to where it cannot be accessed for use.	Valued groundwater recharge and reservoir water storage compared to cost of water access in absence of ecosystems.
Flood Protection	Natural ecosystems function as sponges that trap and slowly release rainwater and slow the speed of moving floodwater. This combined water storage and regulation lowers flood risk and reduces erosion. Natural stormwater solutions are cost effective compared to engineered facilities.	Compared stormwater capacity of each ecotype to the cost of engineered stormwater facilities and/or avoided damage.
Carbon Sequestration	Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide. Plants capture and store carbon dioxide in the soil which helps with climate regulation.	Calculated metric tons of carbon storage per acre of each ecotype then multiplied by cost of damages avoided annually per metric ton of carbon storage.
Water Quality	Forests, wetlands, and prairies protect water bodies from harmful pollutants and sedimentation by absorbing and filtering water.	Measured nitrogen removal for each ecotype, using spatial analysis of Event Mean Concentration (EMC) to value services in comparison to avoided treatment costs or improved water security.
Air Quality	Trees provide air quality benefits by absorbing carbon dioxide, sulfur dioxide, and nitrogen dioxide. Trees and other plants trap air pollutants that are harmful to humans.	Estimated the metric tons of criteria air pollutants removed from the atmosphere by trees in the region.

Houston Galveston Green Infrastructure and Ecosystem Services Assessment
https://www.conservationfund.org/images/projects/files/Houston_Galveston_Report.pdf

The Ecosystem Services Primer for the Gulf Coast Region
https://static1.squarespace.com/static/52387981e4b0a2c53f25a411/t/5e4401cd72d61415bce9734c/1581515227410/FINAL+-+HW+Ecosystem+Services+Primer+%282nd+Ed%29+for+Greater+Gulf-Houston+-+A+Six+Step+Guide+%28Dec+2019%29-condensed.pdf

The Regional Conservation Initiative works across H-GAC's 13-county region to support conservation projects that protect, restore and enhance natural areas in communities.

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