Trinity Floodplain Prioritization Tool (FPPT)

April 2024

"Floodplains are among the most diverse, dynamic, productive and populated but also the most threatened ecosystems on Earth."[1] Protection and restoration of natural areas within and adjacent to floodplains represent important opportunities to support biodiversity, water quality, carbon sequestration, and flood mitigation outcomes. These areas can also provide recreational opportunities for nearby communities.

The Trinity River Basin, with nearly 11 million acres of land and over 715 river miles, is the largest river basin that begins and ends in Texas and the most populous basin in the state. The Trinity - called the Arkikosa by the Caddo peoples - serves as the water source to more than half of all Texans; water from the Trinity Basin drains into the Galveston Bay and estuary system, considered one of the most productive ecosystems and commercial fisheries in the nation. The basin includes five major Texas ecoregions, from the Cross-Timbers and Blackland Prairie in the upper portions, through the Post Oak Savannah and Piney Woods in the middle section, to the Coastal Prairies and Marshes along the Gulf coast. Floodplain protection and restoration is an important strategy for supporting the health and resilience of communities and ecosystems in this important basin and the Gulf of Mexico.

The Trinity Floodplain Prioritization Tool (FPPT) is designed to help identify key opportunities for floodplain protection and restoration in the Trinity River Basin. Users are able to specify criteria related to water quality, wildlife habitat, carbon storage, current and future flood risk, and current and projected land use characteristics. The map changes in response to the user selections to identify sites that meet all the selected criteria and help identify the geographies where floodplain conservation is likely to have the greatest positive impact for the conservation and community priorities selected.

This document breaks down the data source for each data element used in the FPPT and is organized consistent with the tool's legend. The Trinity FPPT viewer requires the user to select the rate of flood frequency and the type (size) of watershed. The remainder of the data elements allow the users to define additional filters. Each of the filters is independently activated by the user. Once activated, the user then identifies a parameter to use in the analysis. The parameters are presented as either selection sliders or binary choice buttons. How the parameters are characterized is explained in the descriptions of the filters which includes links to methods and/or data sources.

[1] Schindler et al. Environmental Evidence. 2013

IDENTIFY FLOODPLAIN UNITS

SELECT FLOOD FREQUENCY

The delineation of the 1-in-5-year, 1-in-100-year, or 1-in-500-year floodplain is based on the FEMA base-level engineering (BLE) flood risk data, supplemented with Fathom floodplain data developed for the Texas Water Development Board (TWDB).

To learn more about the FEMA BLE dataset, visit here.
To learn more about the supplementary TWDB Fathom dataset, visit here.

VIEW FLOODPLAINS BY WATERSHED SIZE

The granularity of the watersheds (HUC zone) used in the analysis include HUC-8, HUC-12, and catchment scales. More info

FILTER FLOODPLAIN UNITS

AVAILABLE FLOODPLAIN AREA

AVAILABLE FLOODPLAIN AREA FOR THE CURRENTLY SPECIFIED FLOOD FREQUENCY

Acres of floodplain potentially available for protection and restoration, including areas within the Protected Areas Database of the U.S. (PAD-US). Parcel ownership is not included in this tool. More info

AVAILABLE UNPROTECTED FLOODPLAIN AREA FOR THE CURRENTLY SPECIFIED FLOOD FREQUENCY

Acres of floodplain potentially available for protection and restoration **not** including areas within the Protected Areas Database of the U.S. (PAD-US). Parcel ownership is not included in this tool. More info

WATER QUALITY & SOILS

NITROGEN YIELD TO LOCAL WATERWAY

Kg/yr of nitrogen from within a given watershed exported at the mouth of that watershed (as estimated by USGS SPARROW model), divided by the watershed's area, and normalized to 0-100 scale. More info

NITROGEN YIELD TO GULF OF MEXICO

Kg/yr of nitrogen from within a given watershed that reaches the Gulf of Mexico (as estimated by USGS SPARROW model), divided by the watershed's area, and normalized to 0-100 scale. More info

PHOSPHORUS YIELD TO LOCAL WATERWAY

Kg/yr of phosphorus from within a given watershed exported at the mouth of that watershed (as estimated by USGS SPARROW model), divided by the watershed's area, and normalized to 0-100 scale. More info

PHOSPHORUS YIELD TO GULF OF MEXICO

Kg/yr of phosphorus from within a given watershed that reaches the Gulf of Mexico (as estimated by the USGS SPARROW model), divided by the watershed's area, and normalized to 0-100 scale. More info

SUSPENDED SEDIMENT YIELD TO LOCAL WATERWAY

MT/yr of suspended sediment from within a given watershed exported at the mouth of that watershed (as estimated by the USGS SPARROW model), divided by the watershed's area, and normalized to 0-100 scale. More info

SUSPENDED SEDIMENT YIELD TO GULF OF MEXICO

MT/yr of suspended sediment from within a given watershed that reaches the Gulf of Mexico (as estimated by the USGS SPARROW model), divided by the watershed's area, and normalized to 0-100 scale. More info

DOES THE WATERSHED CONTAIN A STREAM 303(D)-LISTED AS IMPAIRED FOR BACTERIA?

Binary choice: Present or Absent

303(d) listed streams or river segments are considered impaired or threatened waters by a criteria pollutant. Turning on this filter shows only streams or river segments in the Trinity Basin that are threatened or impaired by bacteria. More info

DOES THE WATERSHED CONTAIN A STREAM 303(D)-LISTED?

303(d) listed streams or river segments are considered impaired or threatened waters by a criteria pollutant. Turning on this filter shows all streams or river segments that are 303(d) listed in the Trinity Basin. More info

PERCENT OF FLOODPLAIN IN SOMEWHAT POORLY, POORLY, & VERY POORLY DRAINED SOILS

The percent of floodplain area that is in somewhat poorly, poorly, & very poorly drained soils, according to the SSURGO soils database. More info

SOIL ERODIBILITY INDEX IN THE FLOODPLAIN (K FACTOR)

The K factor quantifies the relative susceptibility of the soil to sheet & rill erosion. It is derived from texture, organic matter content, soil structure, and saturated hydraulic conductivity. It ranges from 0.02 (least erodible) to 0.64 (most erodible). More info

HABITAT

DOES THE FLOODPLAIN CONTAIN A TEXAS TERRESTRIAL PRIORITY CONSERVATION AREA?

Binary choice: Present or Absent

Based on The Nature Conservancy's terrestrial biodiversity conservation blueprint, Priority Conservation Areas are an indicator of the terrestrial ecosystems in Texas that represent important areas for protection of the state's terrestrial biodiversity. More info

DOES THE FLOODPLAIN CONTAIN A TEXAS FRESHWATER PRIORITY CONSERVATION AREA?

Binary choice: Present or Absent

Based on The Nature Conservancy's freshwater biodiversity conservation blueprint, Priority Conservation Areas are an indicator of the aquatic ecosystems in Texas that represent important areas for protection of the state's freshwater biodiversity. More info

TERRESTRIAL RESILIENCE INDEX WITHIN THE FLOODPLAIN

The terrestrial Resilience Score, developed by the Nature Conservancy, estimates the ability of an area of land to sustain biodiversity and ecological functions into the future under a changing climate. A site's Resilience Score was determined by evaluating and quantifying physical characteristics that foster resilience, particularly the site's landscape diversity and local connectedness. Each site is scored relative to all other sites in its ecoregion that have the same geophysical setting based on soils, bedrock geology, and elevation zone. Scores are standard deviations above the average score. Least resilient = -3.5 to -2.0; less resilient = -2.0 to -1.0; slightly less resilient = -1.0 to -0.5; average/median resilient = -0.5 to +0.5; slightly more resilient = +0.5 to +1.0; more resilient = +1.0 to +2.0; most resilient = +2.0 to +3.5. More info

CONNECTIVITY -- ACRES OF FLOODPLAIN NEAR PROTECTED LAND

Acres of unprotected floodplain within 0.25 miles of Protected Areas Database of the U.S.(PAD-US) protected lands. More info

CARBON STORAGE

MEAN ABOVE-GROUND CARBON IN THE FLOODPLAIN

Estimate of above-ground forest carbon stock, (tons C/ha) using methods in Wilson *et al.* (2013). More Info

MEAN BELOW-GROUND CARBON IN THE FLOODPLAIN

Estimate of below-ground C stock, or soil carbon, (tons C/ha) from the NRCS Rapid Carbon Assessment (RaCA). More info

FLOOD RISK – COMMUNITY

POPULATION EXPOSURE TO FLOODS (PRESENT-DAY)

Number of people currently living in the floodplain of the specified flood frequency. Population sourced from Texas Water Development Board (TWDB) buildings data. More info

POPULATION EXPOSURE TO FLOODS (2050)

Number of people expected to be living in the floodplain of the selected flood frequency by 2050, determined using the methods in Wing *et al.* (2018). More info

WATERSHED IS IN A COUNTY WITH HIGH ESTIMATED DIRECT BUILDING LOSSES IN THE 100-YEAR FLOODPLAIN

Binary choice: Present or Absent

Selecting 'present' will show watersheds located mostly within a county containing more than $115.37 million dollars of estimated direct building losses from a 100-year flood. This value was determined by applying the Jenks natural breaks optimization method to the county-level information in Table 2.9, p.2-42, of the Trinity Regional Flood Plan. The top three breaks were selected to represent the areas with the highest estimated direct building losses. More info

PROJECTED FUTURE FLOOD DAMAGES (2050) ($)

Estimate of property damage in the floodplain corresponding to the currently selected flood frequency, given flood depth and projected 2050 land use / building type. Estimated using the methods in Wing *et al.* (2018). More info

CDC SOCIAL VULNERABILITY INDEX

The CDC Social Vulnerability Index (SVI) characterizes census tracts where people are especially at risk during public health emergencies due to factors such as socioeconomic status, household composition, minority status, housing type, and transportation.

The value of the index is a percentile -- e.g. a value of 0.85 indicates the location is in a census tract that is more socially vulnerable than 85% of census tracts in the U.S.

Within this tool, the SVI is assessed for the floodplain area associated with the selected flood frequency. SVI is sourced from Texas Water Development Board (TWDB) buildings data. More info

FLOOD RISK – AGRICULTURE

PERCENT OF FLOODPLAIN IN CROPLAND OR GRASSLAND/PASTURE

The percent of the floodplain area that is used for any type of crop production or for grassland/pasture (working land), according to the 2020 USDA Cropland Data Layer (CDL). More info

WATERSHED IS IN A COUNTY WITH HIGH ESTIMATED CURRENT & FUTURE CROP AND LIVESTOCK PRODUCTION LOSSES IN THE 100-YEAR FLOODPLAIN

Binary choice: Present or Absent

Selecting 'present' will show watersheds located mostly within a county containing more than $11.26 million (current) or $11.90 million (future) crop and livestock production dollar losses from a 100-year flood. This value was determined by applying the Jenks natural breaks optimization method to the county-level information in Table 2.8, p.2-39, and Table 2.35, p. 2-135 of the Trinity Regional Flood Plan. The top two breaks were selected to represent the areas with the highest estimated crop and livestock production losses More info

AGRICULTURAL PRODUCTIVITY POTENTIAL OF SOILS IN THE FLOODPLAIN

The National Commodity Crop Productivity Index (NCCPI) characterizes soil's inherent capacity to produce non-irrigated commodity crops (0 - 1). Lower value suggests less productive soil, and therefore a more viable opportunity for restoration. More info

DEVELOPMENT PRESSURE

DEVELOPMENT PRESSURE IN THE FLOODPLAIN BY 2050 (INDEX)

Development pressure is characterized by comparing ICLUS EPA land use data for 2020 versus 2050 to identify projected land use transitions from less developed to more developed.

A weighting scheme was developed to assign higher weights to more developed land use types (e.g., urban-high) vs. less developed land use types (e.g., exurban-low), in accordance with dollar valuation estimates of these land use types based on the National Structure Inventory (NSI).

A higher index value indicates more extreme transitions (e.g., non-urban to very urban) in more places and a lower index value indicates less extreme transitions (e.g., suburban-low to suburban-high) and in fewer places. More info

DEVELOPMENT PRESSURE IN THE WATERSHED BY 2050 (INDEX)

Development pressure is characterized by comparing ICLUS EPA land use data for 2020 versus 2050 to identify projected land use transitions from less developed to more developed.

A weighting scheme was developed to assign higher weights to more developed land use types (e.g., urban-high) vs. less developed land use types (e.g., exurban-low), in accordance with dollar valuation estimates of these land use types based on the National Structure Inventory (NSI).

A higher index value indicates more extreme transitions (e.g., non-urban to very urban) in more places and a lower index value indicates less extreme transitions (e.g., suburban-low to suburban-high) and in fewer places. More info

SUPPORTING LAYERS

These supporting layers are included to provide a frame of reference for many of the data layers in this tool. Turning any of these layers on will display their full extent, unfiltered by any of the parameters chosen above.

5-YEAR (20% ANNUAL CHANCE) FLOODPLAIN

Floodplain map for 20%-annual-chance storm was produced by Fathom and designated as a "cursory floodplain" dataset for the Texas Water Development Board. More info

100-YEAR (1% ANNUAL CHANCE) FLOODPLAIN

Floodplain map for the 1%-annual-chance storm produced from FEMA base-level engineering (BLE). More info

For the HUC8 'Lower West Fork Trinity', the floodplain map for the 1%-annual-chance storm was produced by "Fathom" and designated as a cursory floodplain dataset for the Texas Water Development Board. More info

500-YEAR (.02% ANNUAL CHANCE) FLOODPLAIN

Floodplain map for the .02%-annual-chance storm produced from FEMA base-level engineering (BLE). More info

For the HUC8 'Lower West Fork Trinity', the floodplain map for the .02%-annual-chance storm was produced by "Fathom" and designated as a cursory floodplain dataset for the Texas Water Development Board. More info

TEXAS FRESHWATER PRIORITY CONSERVATION AREAS

Based on The Nature Conservancy's freshwater biodiversity conservation blueprint, Priority Conservation Areas are an indicator of the aquatic ecosystems in Texas that represent important areas for protection of the state's freshwater biodiversity. More info

TEXAS TERRESTRIAL PRIORITY CONSERVATION AREAS

Based on The Nature Conservancy's terrestrial biodiversity conservation blueprint, Priority Conservation Areas are an indicator of the terrestrial ecosystems in Texas that represent important areas for protection of the state's terrestrial biodiversity. More

LAND COVER (2019)

Multi-Resolution Land Characteristics Consortium (MRLC) National Land Cover Dataset (NLCD) 2019. More info

PROTECTED AREAS DATABASE OF THE U.S. (PAD-US)

PAD-US is America's official national inventory of U.S. terrestrial and marine protected areas that are dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, and managed for these purposes through legal or other effective means. More info

DEVELOPMENT PRESSURE INDEX

This index was calculated by comparing ICLUS EPA land use data for 2020 versus 2050 to identify projected land use transitions from less developed to more developed.

A weighting scheme was developed to assign higher weights to more developed land use types (e.g., urban-high) vs. less developed land use types (e.g., exurban-low), in accordance with dollar valuation estimates of those land use types based on the National Structure Inventory (NSI).

A higher (more red) index value indicates a more extreme projected transition by 2050 (e.g., non-urban to very urban) and a lower (more green) index value indicates a less extreme projected transition by 2050 (e.g., suburban-low to suburban-high). Where no color is present, no development is expected. More info

ESTIMATED DIRECT BUILDING LOSSES IN THE 100-YEAR FLOODPLAIN (MILLIONS OF $)

County-level information is taken from Table 2.9, p. 2-42, in the Trinity Regional Flood Plan. More info

ESTIMATED CROP & LIVESTOCK PRODUCTION LOSSES IN THE 100-YEAR FLOODPLAIN (MILLIONS OF $)

County-level information is taken from Table 2.8, p. 2-39, in the Trinity Regional Flood Plan. More info

POPULATION EXPOSURE TO FLOODS (PRESENT-DAY)

Number of people currently living in the 100-year floodplain shown at the HUC-12 scale. Population sourced from Texas Water Development Board (TWDB) buildings data. More info

POPULATION EXPOSURE TO FLOODS (2050)

Number of people expected to be living in the 100-year floodplain by 2050 at the HUC-12 scale, determined using the methods in Wing *et al.* (2018). More info