







Resilient De Soto

Flood Hazard Mitigation Plan

May 31, 2023

City of De Soto

Acknowledgments

City of De Soto

Elected Officials

Kathy Smith	Mayor
Rich McCane	City Council
Jim Akers	City Council
Autumn Blanchard	City Council Chairwoman Pro-Tem

Senior Staff

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Kevin Warden	Public Works Director

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Karen McHugh	Missouri State Emergency Management
Rosie Buchanan	Economic Development Corporation for Jefferson County
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Eric Larson	Former Director of Jefferson County Services & Code Enforcement
Warren Robinson	Jefferson County Emergency Management Director
Eddie Boyer	Local resident, contractor, developer, and engineer
Susan Liley	Local Resident and Director of the Citizen's Committee for Flood Relief

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Heartland and Coastal Solutions Inc.

Daniel Hanes	Principal Scientist Professor, Saint Louis University

Special Thanks To...

Susan Liley and the Citizens Committee for Flood Relief who took the time to conduct outreach and connect the team with the community; The City of De Soto, The De Soto Library, The De Soto Community Center, Pogolino's, and Just Be Kind Coffee who volunteered their venues to gather the community for Public Workshops and neighborhood outreach events; The brave residents affected by flooding who were willing to sit down, talk to us, and share their stories and the residents, business owners, and stakeholders of De Soto who provided their time, expertise, and input for the development of this Resiliency Plan. Without the brave and outspoken efforts of the community this plan would not have been possible.

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Appendices are included as a separate document to the mitigation plan.

01

EXECUTIVE SUMMARY

Introduction

The City of De Soto, Missouri is a community located in Southwestern Jefferson County of the greater St. Louis region. It boasts a characteristic small town feel with quality parks, historic venues, and a traditional main street parallel to the rail tracks and The Joachim Creek. De Soto is a railroad town and was initially founded along the projected path of the modern day Union Pacific railroad. Residents describe De Soto as a tight knit community with rural charm where in times of need every one comes together to help each other.

Given its location along the Joachim Creek, the City of De Soto has a long association with and unique relationship to water. De Soto was initially founded along the banks of the Joachim Creek in a region known for its artesian wells that once supplied water to a majority of the City. This unique natural feature made living in the area viable and coined the city the nickname “Fountain City”. While water and the Joachim Creek have remained a prevalent part of De Soto’s identity, today, the flash flood characteristic of the Joachim Creek is one of worry and increased anxiety for residents who reside in the Creeks floodplain.

In the last decade De Soto has seen an increase in the intensity and frequency of flash flood events on the Joachim Creek and the events are expected to increase. The nature of these events is highly unpredictable and insufficient data exists to assess when an event will occur or not occur times of heavy precipitation. This leaves residents in a state of uncertainty and heightened anxiety any time it rains in De Soto. After a major flood in 2013, De Soto began taking a look at flood issues as a priority in city policy and within the community a local champion non-profit group, The Citizens Committee for Flood Relief was founded in 2015, as an advocacy group for increased safety and awareness of the families and residents living at risk alongside the Joachim Creek and its tributaries.

Since 2015, The Citizens Committee for Flood Relief and City of De Soto have invested approximately $5 million into flood relief, advocacy, education, and resources including:

- Securing a $100,000 grant for the US Army Corps of Engineers Silver Jackets Program Flood Study (2019)
- Secured a new 2D USGS Study of the Joachim Creek (2019)
- Securing a Water Safety Alarm with NOAA and USGS
- Established partnerships with scientists and hosted educational community workshops on the impact of flooding.
- Advocated at the local, state, and federal level for improved infrastructure, funding, and legislation on behalf of flood victims and other Missouri Towns.
- Presented at a National Advocacy and Awareness conferences in Washington D.C.
- Secured a National Fish and Wildlife Grant to develop Freddy’s Pond & Prairie to mitigate runoff, educate community members, and provide a community amenity.

- Installed a USGS Stream Gage to monitor water levels and remain alert during flood conditions.
- Lined over 21 miles of sewer mains and had over 1100 manholes strong sealed to reduce inflow and backups.
- Conducted numerous smoke testing projects to locate and correct infiltration issues.
- Completed three storm water projects from Williams St. to Fletcher, East Plattin to East Stone, and East Stone to East St. Louis to mitigate runoff on roadways.
- The City is gearing up to daylight the existing drain channel at Valley Pl. by creating an open channel to improve flow and decrease backups to eradicate flooding in the area.
- In three years, De Soto has taken ownership of 7 structures in the floodway – all of which have been removed – and 4 vacant lots (~5 acres of open green space along the Joachim Creek) as part of a long term goal to take structures our of dangerous areas and create natural areas along the Joachim.
- Completed an Emergency Action and Evacuation Plan with the USACE.
- Secured a CDBG grant to develop a holistic flood resiliency plan for the City of De Soto.

Not withstanding this work The City of De Soto still has approximately 230 households at risk in the floodplain. In 2018, the installment of the stream gage has assisted the community in tracking and predicting flood events as an early warning and data collection system. Since the installment of the gage, De Soto has averaged approximately 1 flood event a year.

This flood resiliency plan has been developed to provide The City of De Soto a mitigation strategy that builds on the past efforts of the city and community to outline the future steps to improve the overall health, safety, and welfare of the community and in particular, the role of those living and working in the Joachim Creek floodplain.

Creating the Plan


Fig. 1.1 Public Meeting 2


Fig. 1.2 Public Meeting 2 Breakout


Fig. 1.3 Public Meeting 2 Breakout


Fig. 1.4 Neighborhood Meeting Pogolino's


Fig. 1.5 Neighborhood Meeting Just Be Kind

The De Soto Resiliency Plan is the product of a robust community outreach and engagement process, conducted over the course of 12 months and that builds upon an additional 7 years of community flood resiliency advocacy and planning. This process effectively utilized the knowledge and expertise of De Soto citizens and stakeholders to create a vision and mitigation action plan for a resilient and sustainable future for the City.

The Resiliency Plan Update utilized five (5) key engagement activities:

- **Public Workshops:** The heart of the public planning process, the City of De Soto and planning consultant conducted three (2) public workshops at key points throughout the development of the Resiliency Plan. Public workshops were typically held at 6:30 PM at either the City Hall or the Community Center. Workshops typically consisted of a formal information presentation followed by small-group, facilitated work sessions. Table work boards, facilitates discussion, and keypad polling were all utilized.

- **Implementation Working Group:** The planning consultant conducted meetings with a city assembled committee of residents, county officials, state officials, and city officials to guide the development and direction of the resiliency plan. A total of three (3) implementation working group meetings were held via zoom. These meetings consisted of a formal process update and information presentation followed by a workshop exercise and discussion of the plan development.

- **Resident and Stakeholder Focus Groups:** Buy-In community planning conducted two rounds of resident one-on-ones and open house focus groups. These meetings were held at different public locations throughout the city of De Soto in an effort to receive additional feedback and take the updates to the plan out to the community at different stages of the process. Meetings typically focused on informal conversations around a work board to register key notes and ideas.

- **Stakeholder Interviews:** At the onset of the project the team conducted a dozen stakeholder interviews to guide the development of the planning process and identify key issues and opportunities with regard to flooding in De Soto. These interviews were held via zoom with mapping prompts as a formal discussion with interviewees.

- **Surveys and Educational Outreach:** Buy-In Community Planning continued distributing surveys to asses interest in buyouts and developing community priorities. These surveys were distributed in person at public meetings, focus groups, and resident mailboxes/households. They were also available for access on the Resilient De Soto Planning Process website.

Over 50 De Soto residents non-residents and stakeholders participated in this process. The key Community Issues and Priorities were identified and prioritized by the community and are addressed in the Resilient De Soto Plan.

Key Community Issues & Priorities

Lack of Awareness
There is a general sense that ***people in the flood plain and community at large are unaware of the risks faced in these areas of the City.*** Specifically, the high rental population and high turn over of the area contributes to the problem.

Inconsistent Warning Systems
Residents expressed that the ***current code red system does not always work the way it is supposed to.*** Aside from that, watching the gage is the only way to know when a flood is occurring since De Soto does not have a siren or flood light system in place.

Nature of the Creek
Demand for enhanced cleaning and maintenance of the creek has been present from the onset of the project. There is a perception that the ***material deposits and debris in the creek increase the impact of flooding but obtaining the permits and permissions to clean the creek are challenging*** for the City.

Upstream Development + Infrastructure
Several large scale subdivisions and 15 high hazard dams exist upstream of The City of De Soto and all of their run off drains into the Joachim Creek before making its way to the City. There is a ***heightened concern for dam failure*** and the jurisdiction and management lies outside of The City of De Soto.

Stormwater Management
Many business owners and residents expressed that ***flooding on Main Street and other roads is primarily due to back ups by clogged up storm drains*** and infrastructure.

Voluntary Buy Outs for Residents
Many De Soto ***residents in the flood plain are seeking buy-outs*** for their properties. A lack of funds, challenges in receiving fair market value for these properties, and other regional priority areas have stalled efforts implement this effort.

Affordable Housing and Relocation Options
For residents to commit to a buyout they need places to go and ***De Soto does not have a diverse affordable housing stock*** for residents interested in remaining in De Soto.

Lack of Capital for Insurance, Flood-proofing and Elevations
De Soto is a low to moderate income community and many of its residents cannot afford flood insurance. The Corps Study recommended many properties be elevated and flood proofed but residents indicated they do not have the funds to do so.

Funding, Incentives & Regulation
De Soto has ***limited financial resources to commit to flood resiliency planning and projects.*** It is recommended that the City look into strengthening their stormwater regulations.

Effective Implementation
To achieve ***this Resiliency Plan it needs the support and cooperation of federal, state, county, and local partners***. All partners need to ensure that best practices are utilized at both at the city and watershed levels.

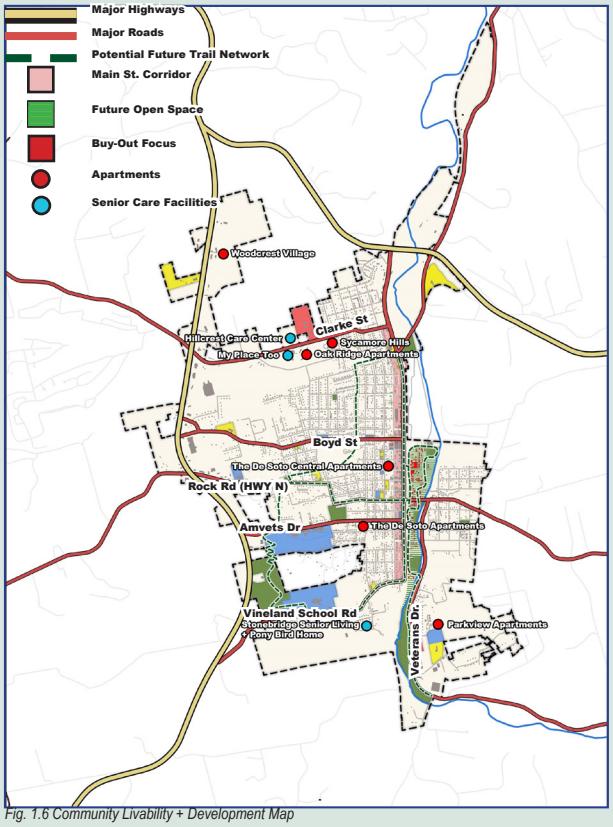

Fig. 1.6 Community Livability + Development Map

Mitigation Strategy

The vision of a Resilient De Soto is established on the notion that for De Soto to achieve the Resiliency goals and initiatives necessary, the plan must be based on a multi-disciplinary approach that seeks to make the city socially, economically, and flood resilient. The are three premises to the De Soto vision and series of 8 goals and 22 objectives to the plan:

De Soto needs a balanced holistic approach to flood resiliency, economic resiliency, and social/community resiliency.

Flood resilience initiatives need to improve the overall quality-of-life for all residents and create a safer community for those at risk.

The at-large community influences the tax base, projects, and economic gain in the city, and a strong diverse economic foundation is necessary to develop resiliency and mitigation projects and efforts.

GOAL 1: Community Livability + Development

In conjunction with increasing flood resiliency improve the quality-of-life and public amenities in the historic downtown and neighborhoods adjacent to the Joachim Creek.

Objective 1: *Create new flood detention opportunities and expand the floodable park area adjacent to Joachim Creek and tributaries.*

Objective 2: *Strengthen and revitalize the historic downtown and program the emerging park space as major community assets and defining features of De Soto.*

Objective 3: *Promote the development of affordable housing and choice neighborhood development throughout the city in areas that do not flood.*

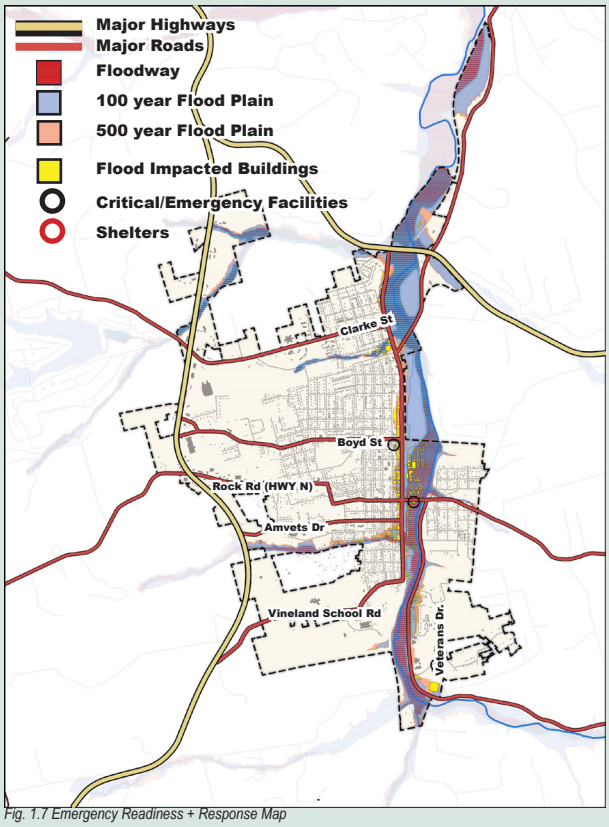

Fig. 1.7 Emergency Readiness + Response Map

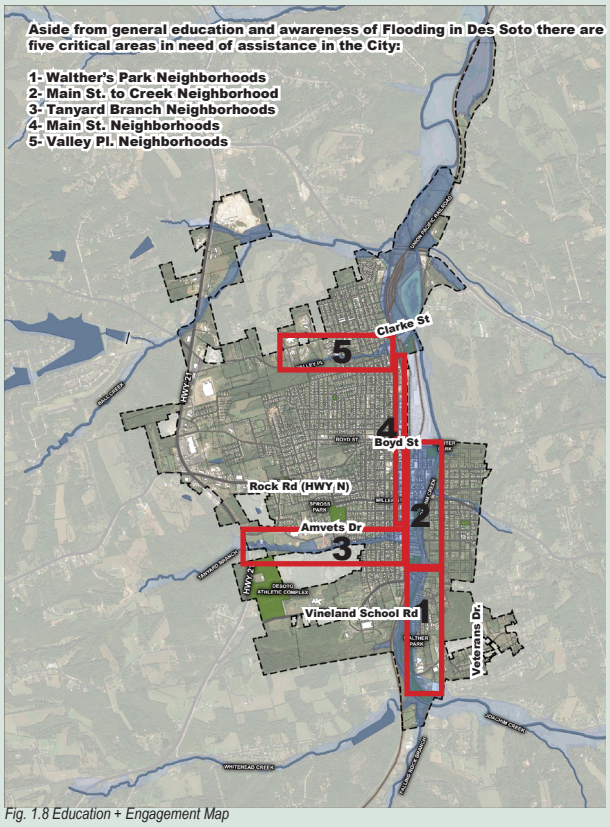

Fig. 1.8 Education + Engagement Map

GOAL 2: Emergency Readiness + Response

Protect the health, safety, and welfare of residents and businesses in all flood situations.

Objective 1: *Strengthen the City and County's critical service and resiliency infrastructure including the response coordination and capacity of police, fire, and medical support during flood conditions.*

Objective 2: *Provide residents and businesses with the necessary information for their own flood readiness, protection and evacuation.*

Objective 3: *Regularly publish and update the Emergency Action and Evacuation Plan for De Soto and encourage the county to develop a similar plan for The Upper Joachim Watershed.*

GOAL 3: Education + Engagement

Implement a city-wide education program to increase awareness of the flooding issues in De Soto and a more informed, pro-active and engaged community.

Objective 1: *Develop community wide education, outreach, and advocacy programs to educate the public on the history of flooding, flood plain hazards, prevention, and preparation.*

Objective 2: *Create targeted outreach and public safety programs for floodway residents and create community service opportunities to support floodplain programs.*

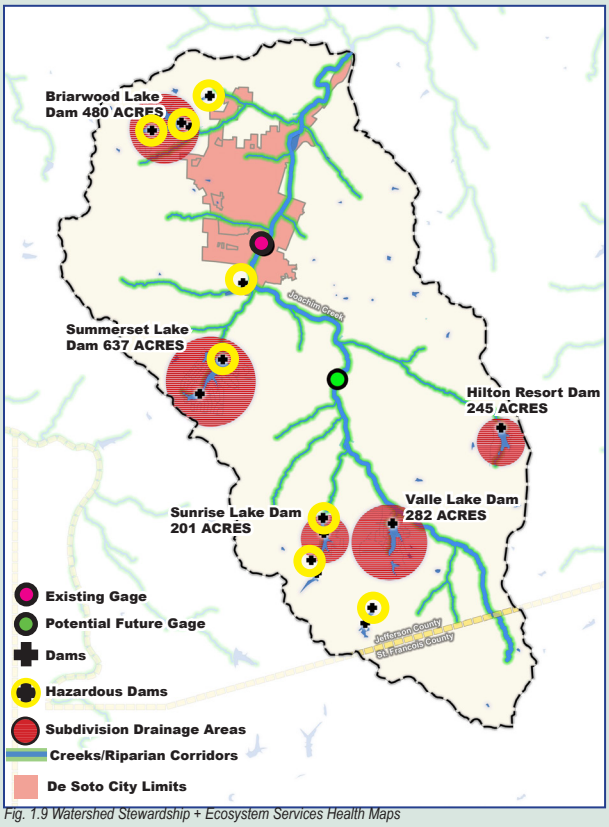

Fig. 1.9 Watershed Stewardship + Ecosystem Services Health Maps

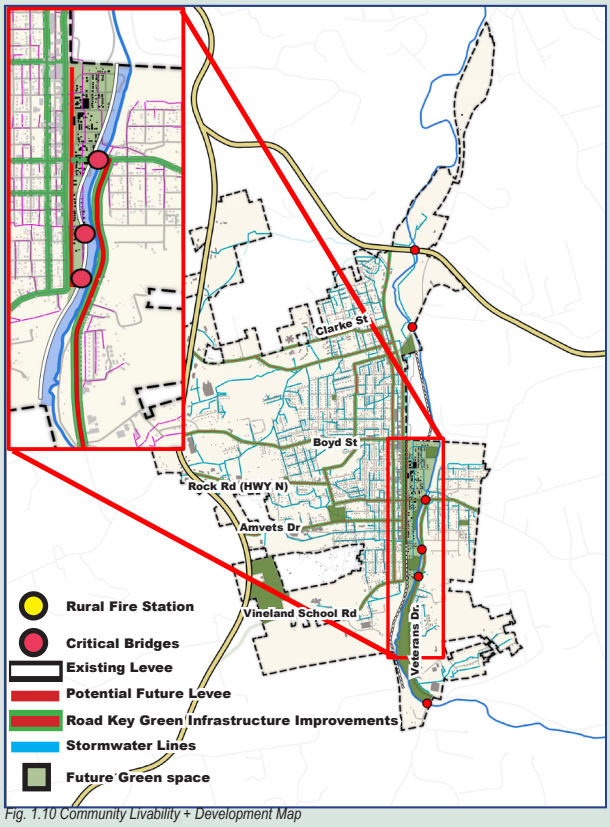

Fig. 1.10 Community Livability + Development Map

GOAL 4: Watershed Stewardship + Ecosystem Services Health

Actively cooperate with, city, county, and state leadership to maintain the condition of and promote best risk management and mitigation and development practices within the Joachim Creek and Upper Joachim Watershed.

Objective 1: *Support basic and applied research toward a specific understanding of the particular existing and future flash flood and underground river system conditions and nature within the Joachim Creek Watershed.*

Objective 2: *Promote and monitor best practices in watershed management throughout the Upper Joachim Creek Watershed to ensure increased public safety and to minimize property flood damage.*

Objective 3: *Enhance and preserve the natural habitat and ecosystems health and services in the Upper Joachim Creek Watershed.*

GOAL 5: City-Wide Essential Services + Green and Blue Infrastructure

Actively cooperate with, city, county, and state leadership to maintain the condition of and promote best mitigation and development practices within the Joachim Creek and Upper Joachim Watershed.

Objective 1: *Increase the floodable park area and improve the flow of the Joachim Creek through the City of De Soto to improve life-safety measures and reduce the property damage impact of flooding.*

Objective 2: *Use nature-based and structural flood infrastructures to reduce flood damage to Main Street and key historic assets.*

Objective 3: *Re-locate all emergency and critical service facilities out of the floodway, and promote the residential buy-out program.*

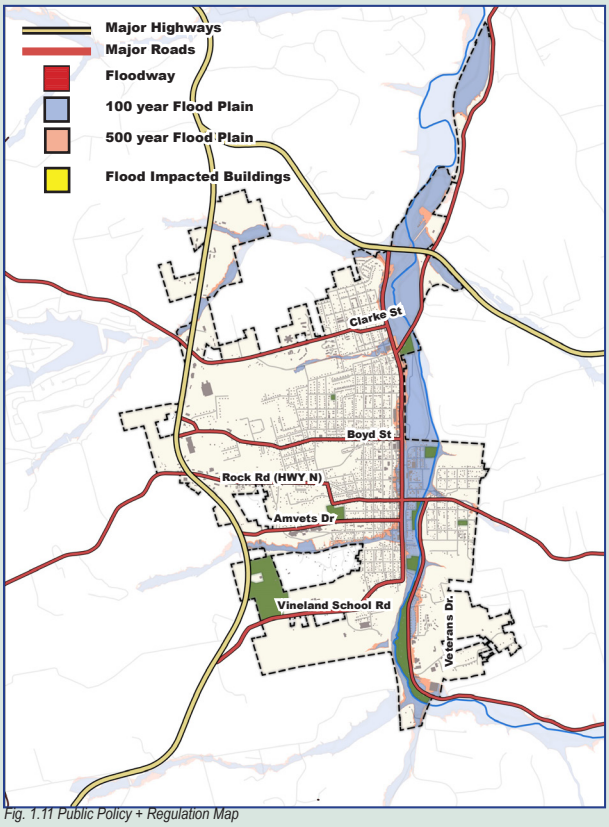

Fig. 1.11 Public Policy + Regulation Map

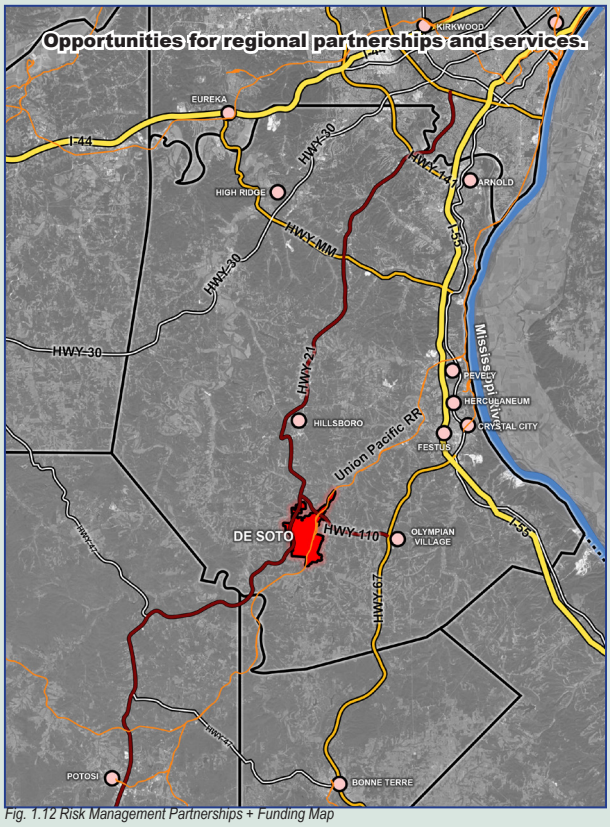

Fig. 1.12 Risk Management Partnerships + Funding Map

GOAL 6: Public Policy + Regulation

Build a transparent system of accountability by codifying and enforcing mitigation best practices and development regulations that reduce stormwater and runoff impacts in the Upper Joachim Watershed.

Objective 1: *Promote nature-based development and design standards and ecosystem services to limit the impact of stormwater runoff within the Upper Joachim Watershed.*

Objective 2: *Develop best practices land use regulations and a public green infrastructure plan for flood resiliency in the City of De Soto.*

Objective 3: *Create a community support system for residents impacted by floods.*

GOAL 7: Risk Management Partnerships + Funding

Effectively utilize existing resources and expand sources of revenue to finance critical flood mitigation projects while improving the overall fiscal resiliency of the city.

Objective 1: *Expand city, county and state organizational, financial, and development partnerships.*

Objective 2: *Study the economic gaps and opportunities available to the City of De Soto and create a City of De Soto Economic and Community Development Comprehensive Plan.*

Objective 3: *Leverage local, state, and federal grant funding as well as non-traditional sources of funding to facilitate the herein flood resiliency programs and projects.*

How This Plan Will be Used

The De Soto Resiliency Plan builds upon the existing work of the USGS, Corps of Engineers, City of De Soto, and local non-profit organizations by reviewing, revising, and organizing an already extensive list of recommendations into a priority based metric for implementation. This framework is needed for decisions to be guided by a vision for the long-range improvements needed to achieve better quality of life and community welfare in high risk floodable areas. Rather than identify a specific "end state" for the City of De Soto, this Plan is structured as a guide and as a call to incremental future action by the City for flood resiliency.

This plan presents a vision, goals, strategies, and action items for the City, which are reasonable, feasible, and important to the health safety and welfare of the entire community during times of critical flooding. The value of the Plan will be measured by the degree of success the community achieves in its implementation. The effectiveness of the Plan is directly related to the continual recognition of the proposals which are included herein, by the City Council, City staff, and the other appointed boards and commissions of the City and their wok to form the necessary partnerships to accomplish the work and support the initiatives of the plan.

This plan recognizes that no planning system can be entirely quantitative and objective. There will always be a need for subjective judgment by elected and appointed officials, particularly in a mature community with established patterns and institutions. The key to successful resiliency planning in this environment is to make subjective decisions that are wise, forward-thinking, and coordinated over time and incorporate them with the established institutions and programs for a quick and seamless execution where applicable.

The City Manager, Floodplain Administrator, and City Council play a critical role in the resiliency planning process and must be alert to the needs of the community as the evolve as well as the capacity of the City of De Soto to implement and achieve the recommended actions. It must bring such needs to the attention of the agencies within the community having direct responsibility for public improvements and roles in implementation. The appraisal of local needs and the continued application of the planning assumptions and goals set forth herein will assure maximum benefits from the Plan and will result in the orderly and economical attainment of the goals established in the Plan.

The plan becomes a tool for communicating the City's resiliency goals and coordinating individual decisions into a consistent set of actions that harmoniously shape the City's flood safety and resilience. It should be used to update and inform administration of the City's existing partnerships and tools, which include, but may not be limited to the following:

- Zoning Ordinance
- Floodplain Ordinance
- Stormwater Control
- Emergency Action and Evacuation Procedures
- Future Land Use Planning
- Buy Out Programs and Initiatives
- Housing and Relocation Planning

The City of De Soto has a responsibility to see that the Plan is implemented and updated as needed, to be responsive to changing conditions. City staff and appointed boards and commissions will have the Resiliency Plan to assist in identifying projects to be taken on by their committees and departments, or as partnered initiatives to work towards flood resiliency. Close cooperation

between the City Council and City Departments, and City Manager will be essential to proper administration of the Plan. Coordination with other governmental entities and jurisdictions in Jefferson County and the State of Missouri will also be important to the realization of the City's resiliency planning goals and action items.

To that end, the Resilient De Soto Plan will be used in several ways:

1. **As a Risk Management Guide for Future Land Use, Infrastructure, and Policy.**
    - To provide the City with an explicit statement of public policy and key infrastructure projects to assist them in their weekly, monthly and annual decision making and budgeting on specific development and land use issues related to flood resiliency and mitigation.
    - To provide administrative continuity through successive City administrations in dealing with flood resiliency and future development.
    - To provide the community with confidence that recommendations in the Plan are based on the public's participation and input, and that changes made in the community will be gradual and sensitive to the public's needs and interests.
2. **As an Outline for Public Education and Engagement**
    - To provide a framework for future engagement and education of the residents population of De Soto and high risk neighborhoods.
    - To assist the city in taking a proactive role for the personal preparedness and assistance provided to residents in high risk areas of the City.
    - To determine an appropriate baseline for continued updates and revisions to the plan on five year intervals.
3. **As an Economic and Community Development Tool for Implementation**
    - To leverage the plan, its structure, and initiatives as a tool for increased funding and enhanced tax structures.
4. **As a Call to Action**
    - To articulate and serve as a call to action on City of De Soto's initiatives for flood resiliency, including saving main street, restoring the condition of the Joachim Creek by developing open, floodable park space and ecosystem restoration, getting people out of harms way via a city voluntary buy out initiative, and strengthening local, regional, and state partnerships to implement resiliency upstream and at a Watershed Level.

The Plan is intended to be flexible, so that it can respond to changing community conditions. At the same time however, the Plan should facilitate a proactive approach to the resiliency planning and decision making process for the City. It recognizes that the City cannot predict the future, but it should equip itself to respond to disaster and remain resilient against impact of flooding by guiding events to achieve a vision for community resilience.

02

THE RESILIENCY PLAN

Structure of The Plan

The Resilient De Soto Plan was developed using the FEMA Mitigation Plan Guidelines to create a structure for the plan that lends itself to the expanded opportunities for state and federal grants available for implementation to the City of De Soto.

Within this resiliency plan document there are eight key chapters as follows:

1. ***Community Profile*** - A summary of the City of De Soto's existing resources, physical, built, and natural, and fiscal features.

2. ***Plan Update*** - A summary of the updates in this plan to past plans and studies conducted for flood resiliency efforts by or on behalf of De Soto.

3. ***Planning Process*** - An overview of the planning engagement process.

4. ***Risk Assessment*** - An assessment of vulnerabilities and risks faced by De Soto residents with an emphasis on priority areas.

5. ***Capability Assessment*** - An assessment of De Soto's existing tools and resources for implementation and governmental capacity for implementation.

6. ***Mitigation Strategy and Implementation Plan*** - The recommendations to the City of De Soto to achieve city wide flood resiliency.

7. ***Plan Adoption*** - Evidence of adoption for the plan by the City of De Soto.

8. ***Plan Maintenance and Implementation*** - A record of the necessary city initiatives and structures to oversee and implement the plan in the next decade.

Note: At this time there are no plans by the City to officially adopt the plan. If selected for adoption in the future chapter 8 would be updated with the approved ordinance.

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In addition to the Resiliency Plan Document a separate appendices document has been developed to support the planning efforts with the collected data from the entirety of the planning effort. This includes sub-planning efforts, engagement reports, base mapping exercises, etc. The appendices report is outlined into the following 9 sub sections:

1. ***Appendix A – Base Maps***: Appendix A includes enlarged version of the planning base maps used for the planning process. (Refer to pages 129-138.)
2. ***Appendix B – City Wide Assessment:*** Appendix B includes the full analysis document used to form the community profile. (Refer to pages 141-164)
3. ***Appendix C - Vulnerability Assessment:*** Appendix C includes the full analysis document used to form the risk assessment.
4. ***Appendix D - Economic Framework and Market Analysis:*** Appendix D includes the De Soto Economic Framework and Market Analysis.
5. ***Appendix E - Voluntary Buyout Plan Framework:*** Appendix E includes the Voluntary Buyout Plan Framework which guides the City of De Soto on the future implementation of said program to be administered by the City.
6. ***Appendix F - Housing and Relocation Strategies Report:*** Appendix F includes the Housing and Relocation Strategies Report with recommendations for an assisted City relocation and housing development program,
7. ***Appendix G - Engagement Materials and Reports:*** Appendix G includes the Engagement Materials and Meeting reports used throughout the planning process.
8. ***Appendix H - Mitigation Plan and Action Plan Extract***: Appendix H is an extract of the action plan and action item charts and priority metrics.
9. ***Appendix I - Grants and Funding***: Appendix I is a list of applicable grants and funding sources De Soto could use to implement mitigation action items.

This structure of the overall plan is visionary, concise, and clearly outlines The City of De Soto's resilience goals and aspirations for the future to provide an actionable road map for effective implementation.


DESOT

2.1

COMMUNITY PROFILE

Regional Context

The City of De Soto is located in Jefferson County, Missouri and forms part of what is technically considered the Greater St. Louis Metropolitan Area. With a population of 6,435 De Soto is the third largest community in Jefferson county following Arnold, MO and Festus, MO. In general, De Soto is removed from the primary growth corridors of the county along Interstate 55 and just south of St. Louis County. With a location in southwestern Jefferson county it primarily serves a surrounding rural population and other smaller cities (Fig 2.1.1).

Regional Connectivity

De Soto is regionally connected to rest of the metropolitan area via highways 21 and 110, which are the primary entry points into the City. Further, both highways connect to larger city and national arterial roads. Highway 21 connects further north to Highways MM, 141, and I-270 which is the St. Louis areas major transit loop serving St. Louis county. Highway 110 connects to US-67 which provides further access to Interstate 55, a major national north south connector. De Soto is approximately a 20 minute drive from Festus, the counties second largest city and prime regional resource, retail, employment, and entertainment center for the area. While De Soto does have a rail connection, it is not a passenger accessible rail and only serves as a transport through the city or into the rail yard adjacent to the City for repairs (Fig 2.1.2).

Regional Centers and Destinations

The primary county growth corridors along Interstate 55 and further north toward St. Louis represents the significant employment, retail, and resource centers in the region. Approximately, 2,300 people commute out of De Soto daily for work in the region making De Soto a key bedroom community for regional employers. Likewise, critical medical care, retails and other resources are located 20 minutes in Festus, MO and other parts of the I-55 corridor. A typical commute to the area would last between 20-30 minutes and on average people commute approximately 31 minutes to regional employment centers from De Soto (Fig 2.1.3).

De Soto is at the center of a few key regional recreational sites (Fig 2.1.3):

- Washington State Park
- St. Francois State Park
- Sandy Creek Historic Site

These sites attract regional and state visitors yearly and could present and economic, and tourism opportunity for De Soto.

Regional Landscape & Natural Features

Jefferson county is extremely hilly with several major creeks and streams that carve their way to the Mississippi River. De Soto sits with these hills in the lower county within the Upper Joachim Creek Watershed where the Joachim Creek originates and bisects the city on its trajectory east. Most of the creeks and streams make their way into the Joachim Creek upstream of De Soto and through the city (Fig 2.1.4).

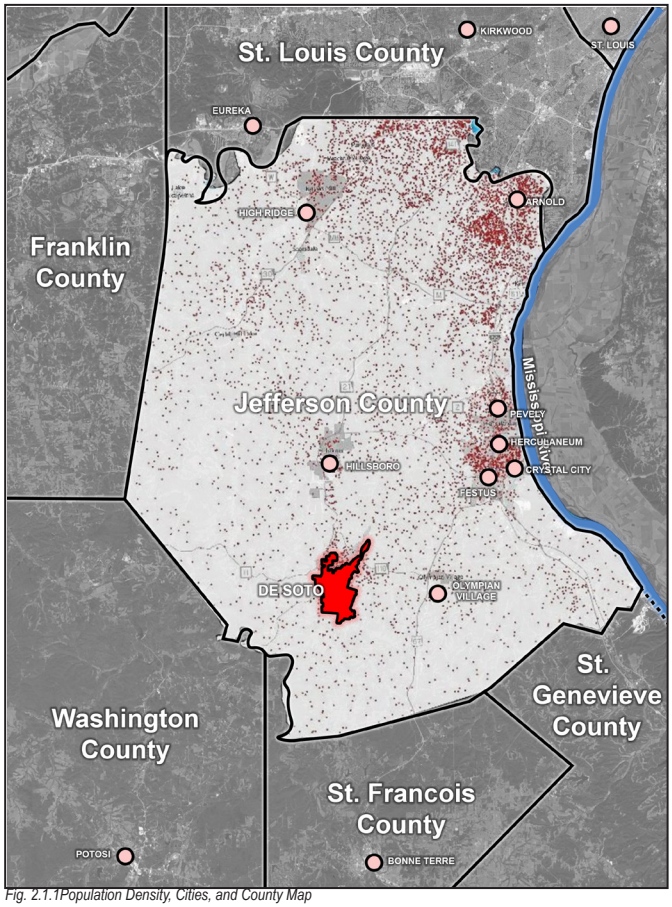


Fig. 2.1.1Population Density, Cities, and County Map

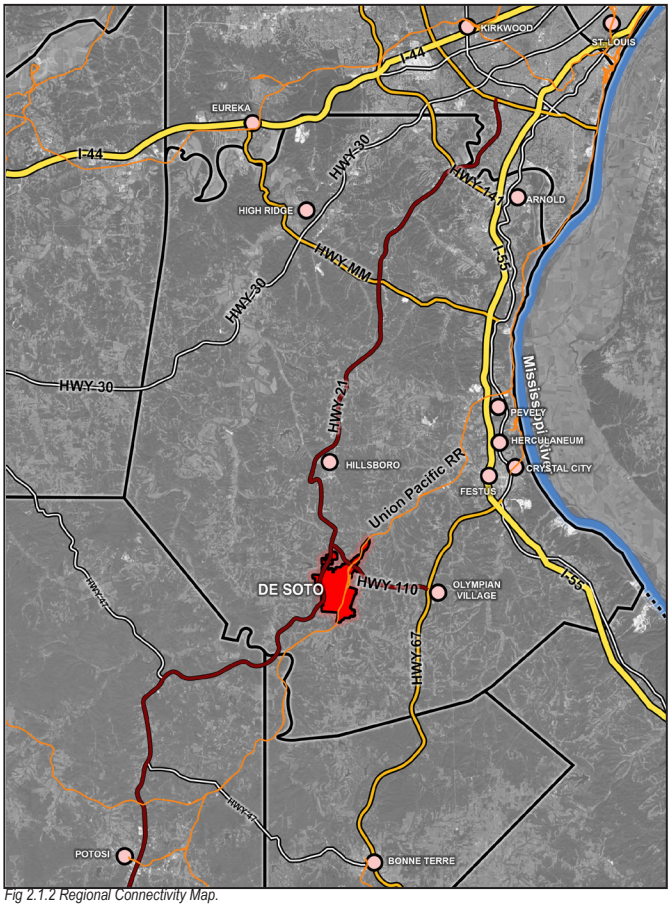


Fig 2.1.2 Regional Connectivity Map.

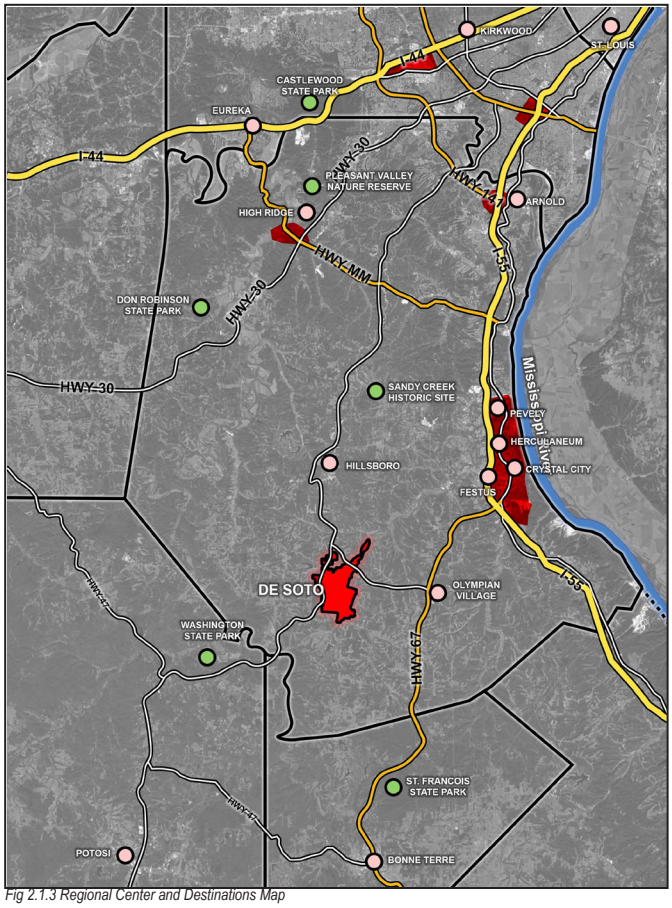


Fig 2.1.3 Regional Center and Destinations Map

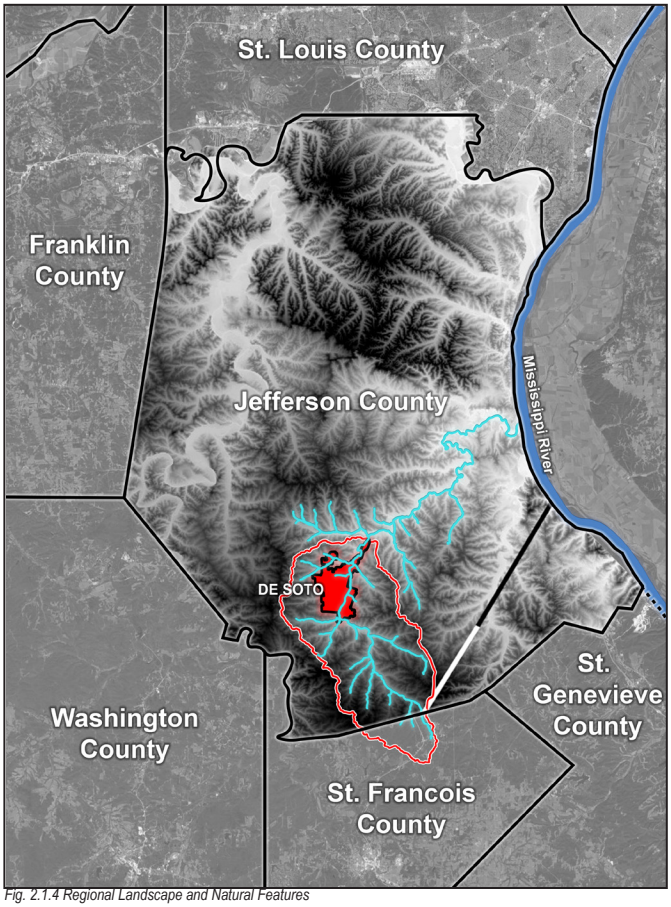


Fig. 2.1.4 Regional Landscape and Natural Features

Upper Joachim Creek Watershed

The Upper Joachim Creek Watershed is located in Southwestern Jefferson County and Northern St. Francois County (where the Joachim Creek originates). The watershed has a drainage area of 39,150 acres with 1,642 acres (5% of the watershed) considered FEMA flood hazard areas. As the only incorporate city in the Watershed De Soto receives a significant amount of the flow of water given 13 of the tributary streams, flow into the creek upstream of the City of De Soto posing an increased flood risk to the area.

Land form and Geomorphology

The composition of the watershed land is categorized:

- 69.8% Forest
- 17.3% pastures and grassland
- 7.3% Open/Barren Land
- 5.6% low to high intensity development.

The composition of the land is spread across a series of small valleys tucked between bluffs with some of the highest elevations located south and west of the city on the border between Jefferson and St. Francois Counties where mining and quarrying was once a prevalent industry. The relationship between these historic mines and the hydrology of the county often meant that harmful toxins produced as a result of mining were carried downstream into the City and other county properties. Since 2007, over 3,000 properties have been tested and 946 have been re-mediated. Missouri Department of Natural Resources water quality information indicates that the Joachim Creek and its tributaries does not at this time have any form of impairment or contamination.

Jefferson County and in particular this watershed are generally very rocky with a bedrock level that is very close to the surface at an average depth of 25’ making excavation for mitigation and detention purposed extremely challenging and expensive to implement in the watershed. Approximately 6 different types of rock formations can be found in the watershed. Along the creek a high erodibility endangers the safety of De Soto’s historic downtown at peak flows and flooding. Further upstream in undeveloped areas of the creek the erodibility contributes to increased debris and sediment deposits which disrupt the flow of water and intensify flooding.

Hydrology

Approximately 65% of the watershed drainage area is upstream of the City of De Soto posing an increased threat of flooding to the City. Additionally, the area has a history of significant natural streams and underground wells which contribute to the intensity and flow of water in peak precipitation times. Many of those underground sources lie at shallow deaths below the surface. According to mapping done by the Missouri Department of Natural Resources underground water sources can lie less than 100’ below the surface in this area. Given the nature of the bedrock in the Joachim Creek and watershed overall. Water flow occurs and peak speeds posing and increased threat to the city of De Soto whose banks along the creek are already susceptible to high factors for erosion.

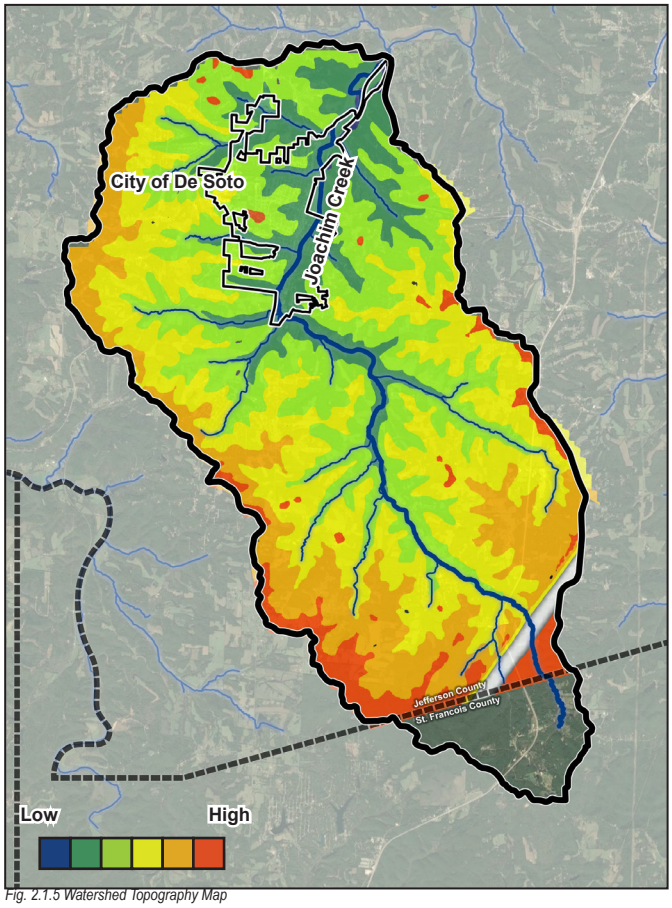


Fig. 2.1.5 Watershed Topography Map

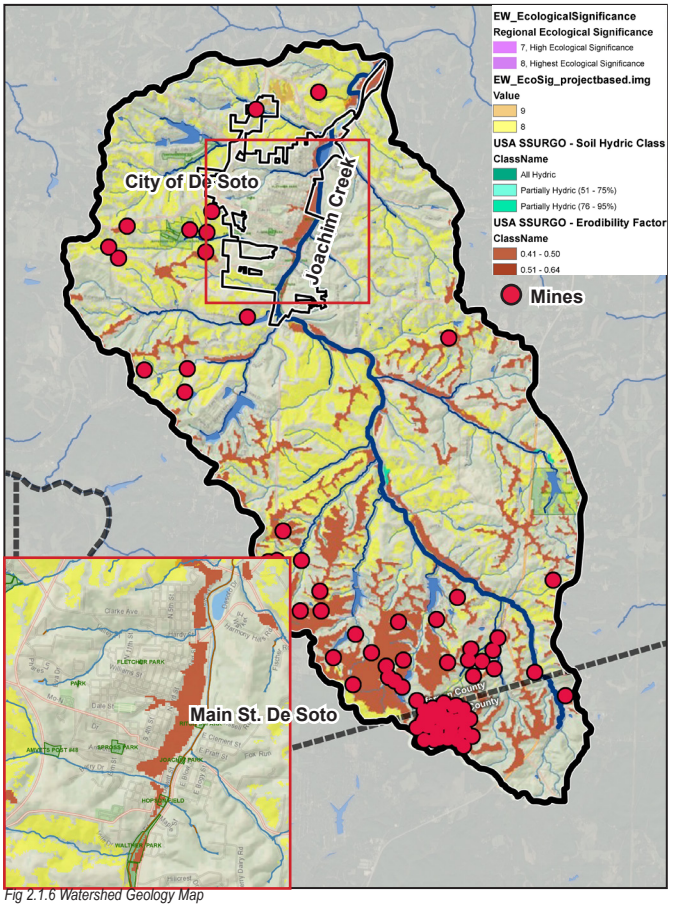


Fig 2.1.6 Watershed Geology Map

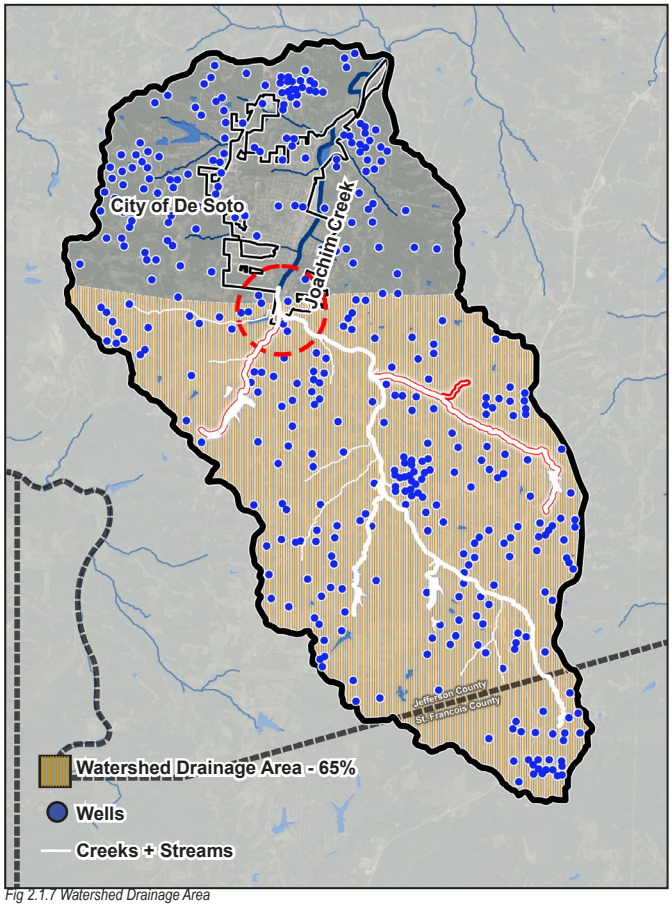


Fig 2.1.7 Watershed Drainage Area

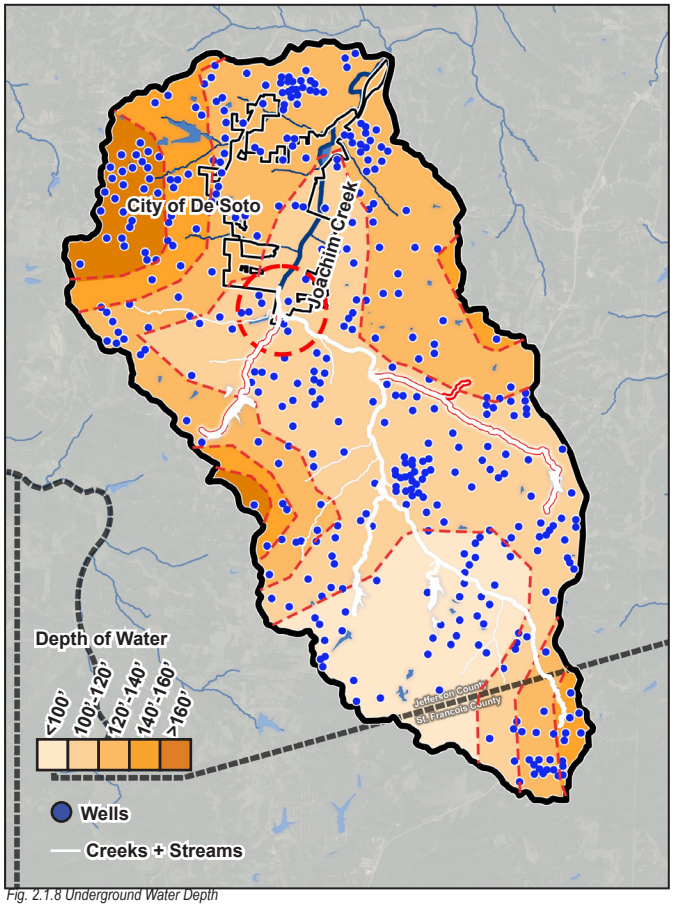


Fig. 2.1.8 Underground Water Depth

Watershed Infrastructure and Development

Upstream watershed development and infrastructure, which is out of the jurisdiction of the City of De Soto is creating unrest for the community. Currently, there are 15 dams upstream of the city which are classified as hazardous and are unregulated. Should these dams fail during a heavy precipitation event, their collapse would result in significant loss of life and damage for the City of De Soto .

Most of these dams, most notably the dam at Valle Lake, the largest of the 15 draining into the Joachim, have limited flood and water storage functions and remain susceptible to over topping. The following chart displays the classified hazardous dams and their most recent inspection dates.

These dams have historically been created for the development of large scale private sub-divisions. Currently, there are five of these subdivisions upstream of De Soto with a combined acreage of approximately 1,365 acres of land. All of this additional runoff from the lakes and dams flows into the Joachim Creek intensifying the hazardous flooding conditions in the City. Through conversations, it was determined that partnerships to regulate these dams are challenging to acquire and there is no interest on the part of the subdivisions stakeholders.

Dam Name	NID ID (MO)	River	Year Completed	State Regulated	Owner Name	Height (ft)	Storage (acre-ft)	Type	Purpose	Hazard Potential	EAP	Last Inspection
Clear Lake Dam	30437	TR to Joachim Creek	1961	No	Sunrise Lakes Association	34	236	Earth	Recreation	High	Not Required	5/7/1981
Dierberg Lake Dam	30441	TR to McMullen Branch	1968	No	WMC DIERBERG	26	56	Earth	Flood Control	High	Not Required	-
Fisherman's Lake Dam	31035	TR to Ball Branch	1970	No	Briarwood Development CO	34	236	Earth	Recreation	High	Not Required	8/2/1978
Lake Kearbey Dam	11099	TR to Sugar Creek	-	No	Dave Kearney	25	54	Earth	Recreation	High	Not Required	9/9/1980
Lake Briarwood Dam	30400	Ball Branch	1970	Yes	Schmitt	65	1840	Earth	Recreation	High	Yes	3/10/2016
Lembeck Lake Dam	30369	Whitehead Creek	1958	No	DR. Chang K. Yang	26	348	Earth	Recreation	High	Not Required	3/5/1981
Little Lake Dam	30456	TR to Joachim Creek	1961	No	Sunrise Lakes Association	32	68	Earth	Recreation	High	Not Required	5/8/1981
Lower Valle Mines Dam	30439	TR to Joachim Creek	1952	No	Valle Mining Company	22	82	Earth	Other	High	Not Required	8/15/1980
Lucas Lake Dam	30454	TR to Joachim Creek	1960	No	Edwin+Thelma Lucas	25	94	Earth	Flood Control	High	Not Required	-
Rustic Hills Resort Lake Dam	30458	TR to Joachim Creek	1957	No	Rustic Hills Resort LTD	28	90	Earth	Recreation	High	Not Required	-
Siesta Lake Dam	31199	TR to Fritz Creek	1957	No	Joe+Rebecca Merten	30	160	Earth	Recreation	High	Not Required	3/4/1981
Spring Lake Dam	31193	TR-Falling Rock Branch	1976	Yes	Summerset POA	42	178	Earth	Recreation	High	Yes	7/27/2016
Spring Lake Dam (2)	30401	TR Ball Branch	1970	No	Briarwood Development CO	20	64	Earth	Recreation	High	Not Required	8/2/1978
Summer Set Lake Dam	30459	Falling Rock Branch	1974	Yes	Summer Set POA	63	3750	Earth	Recreation	High	Yes	7/26/2016
Sunrise Big Lake Dam	30457	TR to Joachim Creek	1961	Yes	Sunrise Lakes Association	38	168	Earth	Recreation	High	Yes	1/17/2017
Sunrise Lake Upper Dam	31190	TR to Joachim Creek	1961	Yes	Sunrise Lakes Trustees	37	360	Earth	Recreation	High	Yes	10/31/2017
Upper Valle Mines Dam	30370	TR to Joachim Creek	1958	No	Valle Mining Company	34	291	Other	Tailings	High	Not Required	8/15/1980
Valle Lake Dam	30438	Fletcher Branch	1955	Yes	Valle Lake Prop Own Assn	39	800	Earth	Recreation	High	Yes	10/3/2017
Winter Haven Lake Dam	31192	Falling Rock Branch	1978	Yes	Summerset POA	49	301	Earth	Recreation	High	Yes	7/26/2016

Fig. 2.1.91 High Hazard Dams

Valle Lake is a class two hazard dam and of the dams in the watershed it presents the greatest threat to the City of De Soto if it over tops during a peak storm event.

Fig 2.1.92 Valle Lake Dam Aerial Image

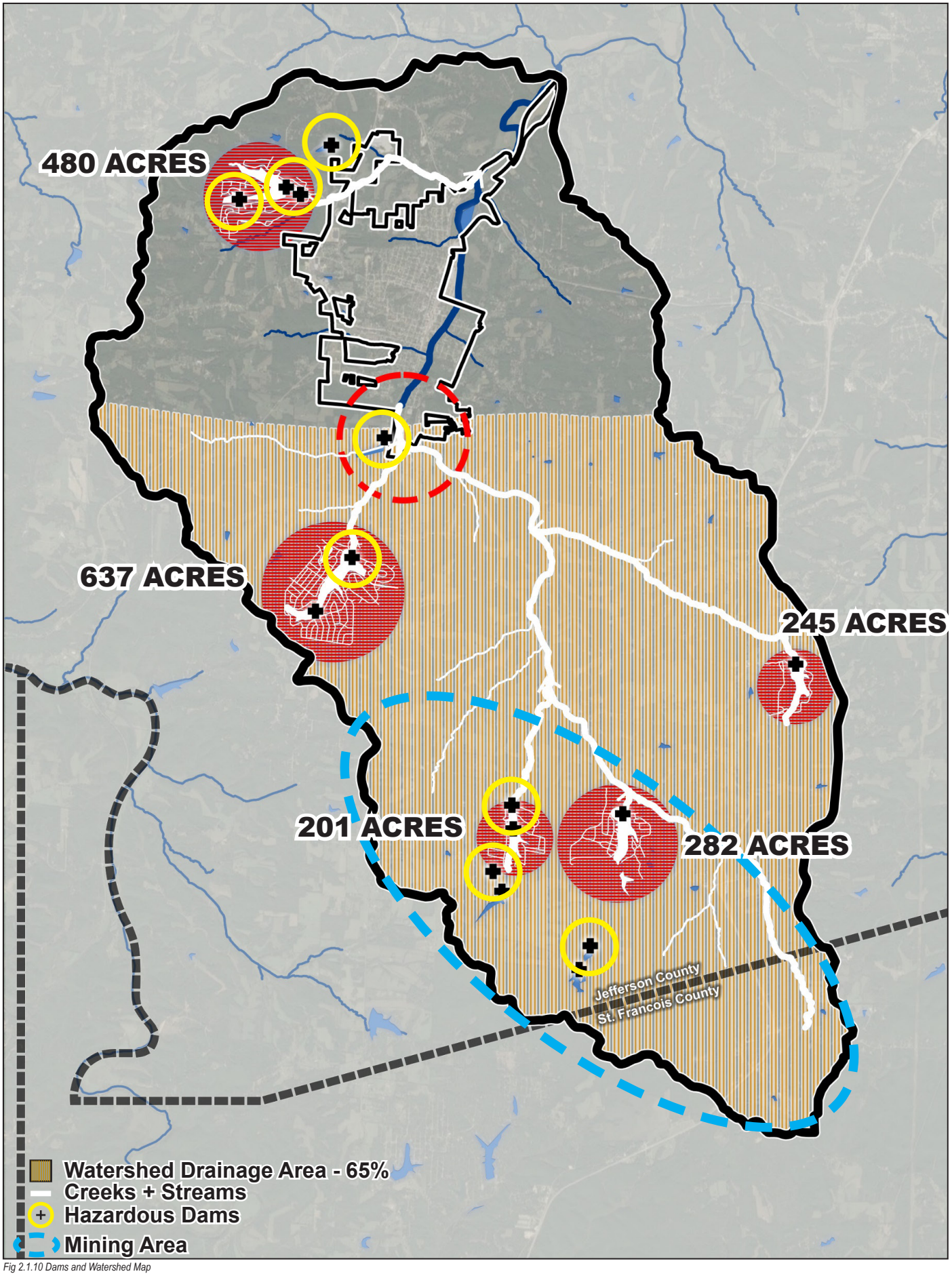


Fig 2.1.10 Dams and Watershed Map

City of De Soto Overview

De Soto was founded in 1858 along the projected path of the incoming St. Louis Iron Mountain and Southern Railroad (Modern day Union Pacific Railroad). As a railroad town it has seen incredible growth and development and it is the railroad which influenced the location of some of its most significant business routes, like main street, and neighborhoods, like the area between Main St. and the Joachim Creek. In addition to being a railroad town, De Soto is also a river town founded along the banks of the Joachim Creek and in an area of Jefferson County, MO known for its hundreds of artesian wells which garnered De Soto the nickname "Fountain City."

1858

De Soto is founded along the Joachim River and projected path of the Union Pacific Railroad.

1859

Town founders build the station depot and the rail line is officially laid between Main St. De Soto and The Joachim Creek

1860

Railroad work and tourism contributes to a booming town and The Arlington Hotel is constructed

1860-1900

The late 19th century saw the development of a new depot, roundhouse, and locomotive shop; expanded city boundaries; several new area schools; larger scale homes; fairgrounds, opera house; business school; newspaper; hospital; saddle shop; mill; meat packing plant; and a few bridges crossing the Joachim creek. The location of the rail depot at Boyd and Main is the commercial center of De Soto.

Early 1900's

The early 1900's saw expansions to local education and recreation with the creation of the YMCA , Jefferson Theater, and Amory.

1920's

In the 1920's a new post office was constructed provided free delivery of mail and a new high school was erected.

1952-1960

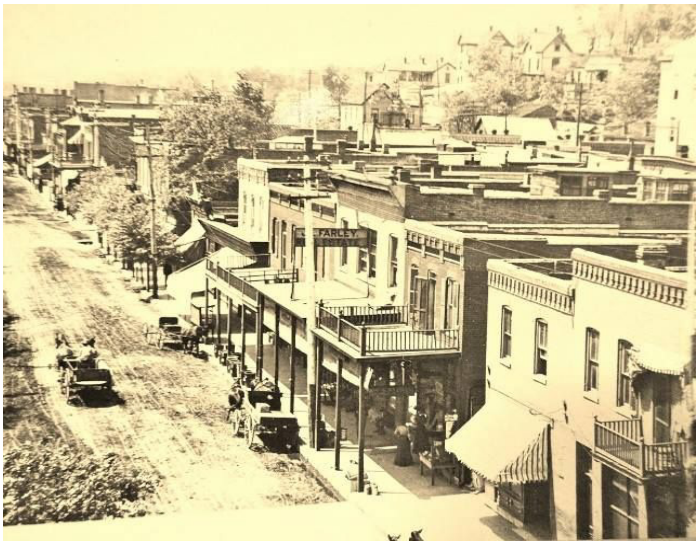
In 1952 an American History class which began improvements to the town won a Union Electric Planned Progress Award. In 1954 and 1959 De Soto is featured as the image of the All American City.

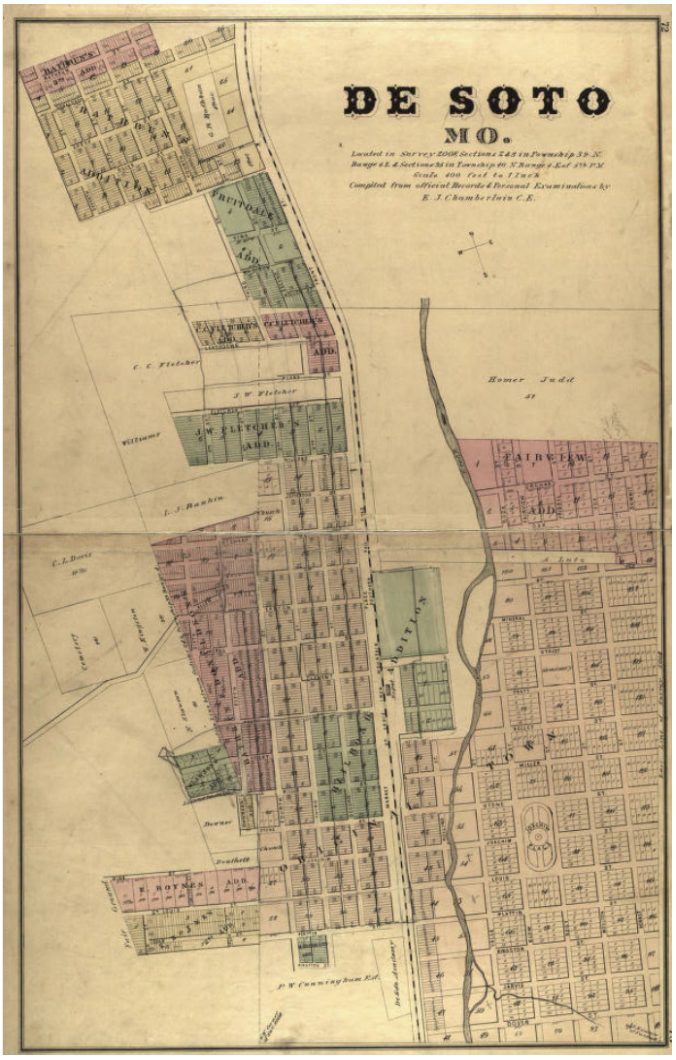
1970-1980

In the 1970's new highway 110 is dedicated expanding access Eastward toward Interstate 55. In 1980 De Soto is named the population center of the United States.

1990's

In the 1990's De Soto amenities expand by widening and beautifying main street, adding a tree museum and gazebo to Walther Park, restoring Arlington Hotel, and moving the public library to S. Main St.





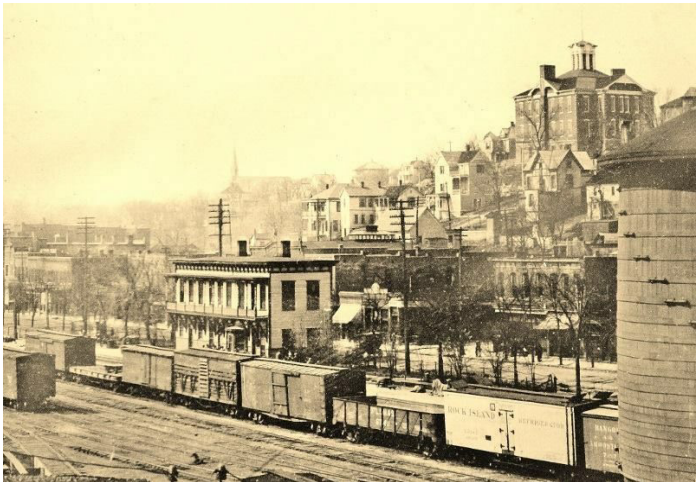


Fig 2.1.10 A-D Historic Images of De Soto. Courtesy of Susan Liley

De Soto Today (2023)

Today De Soto is the third largest city in Jefferson County with a population of 6,435 and total size of 2,860 acres ~ 4.38 square miles. The City is the site of a major national Union Pacific Train car shop which is the companies largest shop and the city of De Soto's largest employer. De Soto also boasts a quality school district, critical modern day retail amenities along highway 21, and a classic single sided main street which formed along the path of the railroad. It is the largest and only city in the Upper Joachim Creek Watershed and the Joachim Creek which bisects the City of De Soto into East and West provides a critical natural amenity for the City which in the last decade has become an intensifying source of fear due to the flooding it experiences impacting residents, businesses, and other critical infrastructure.

City Demographic Data

According to ESRI data, De Soto encompasses a population tapestry known as the Rustbelt Tradition. This tapestry is classified with residents that are a mix of married-couple families, and singles living in older developments of single family homes. (Fig 2.1.11) The workforce of this segment is primarily white collar with a high concentration of skilled labor in manufacturing, retail trade, and health care.

Population Dynamics

Of the 6,435 people living in De Soto census data reports:

- 90.9% are white
- 7% are two or more races
- 1.4% are black or African American
- <1% are Native American, Asian, Hispanic, or Latino

In general the population in De Soto is getting older with a median age of 39. Approximately 82% of city residents have earned a high school degree and only 12% of people in De Soto maintain a higher education degree. Over 1000 households in De Soto (38%) reported having some form of a disability.

Income Dynamics

The average household in De Soto has a median income of $49,024 and spends the most money on healthcare, transportation, entertainment, and food. Approximately 51% of households in De Soto make less than $50,000/year and 23% of households sit below the poverty line. Of the 51% of households that make under $50,000/year 20% make less than $10,000 living in extreme poverty.

The most impoverished and disadvantaged communities in De Soto are located along the Joachim Creek and several of its tributaries meaning that these communities suffer increasingly adverse conditions when flooding occurs due to limited resources and capital for recovery.

Rustbelt Traditions

5D

De Soto City, MO

Geography: Place

TAPESTRY SEGMENTATION
esri.com/tapestry

DOMINANT TAPESTRY SEGMENT

1,184 households are *Rustbelt Traditions*

44.9% of households are in this segment

Rustbelt Traditions: *GenXurban* LifeMode

The backbone of older industrial cities in states surrounding the Great Lakes, Rustbelt Traditions residents are a mix of married-couple families and singles living in older developments of single-family homes. While varied, the work force is primarily white collar, with a higher concentration of skilled workers in manufacturing, retail trade, and health care...

Learn more...

ABOUT THIS SEGMENT

Family-oriented consumers who value time spent at home. Most have lived, worked, and played in the same area for years.

Budget aware shoppers that favor American-made products. Residents take advantage of convenience stores for picking up incidentals.

Watching television is a common pastime. Many households have more than four TVs - watch ABC Family Channel and TNT.

Favorite family restaurants include Applebees, Arbys, and Texas Roadhouse.

Read newspapers, especially the Sunday editions. Residents are connected-entertainment activities like online gaming dominate their Internet usage.

ABOUT THIS AREA

Household Type:
Single Family

Employment:
Svcs; Prof; Admin

Median Age:
39.0

Median Household Income:
$49,024

Education:
31.8% have a college degree

KEY FACTS FOR THIS AREA

Click facts to *'Explore for more'* details

6,440	2,635	2.37	41	176	19	$136,447	-0.02%
Population	Households	Avg Size Household	Wealth Index	Housing Affordability	Diversity Index	Median Home Value	Forecasted Annual Growth Rate

Source: This infographic contains data provided by Esri, Esri-Data Axle, Esri-U.S. BLS, ACS. The vintage of the data is 2022, 2027, 2016-2020.

Fig 2.1.11 ESRI Rustbelt Segment Data

Key Demographic Indicators

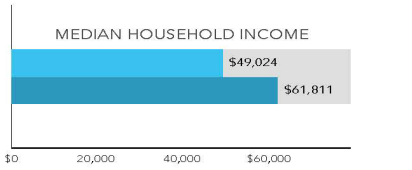
De Soto City, MO

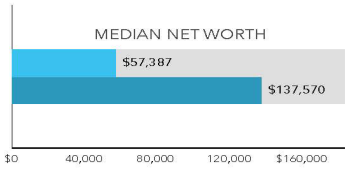
Geography: Place

esri THE SCIENCE OF WHERE

INCOME AND NET WORTH

Net worth measures total household assets (homes, vehicles, investments, etc.) less any debts, secured (e.g, mortgages) or unsecured (credit cards) for this area.



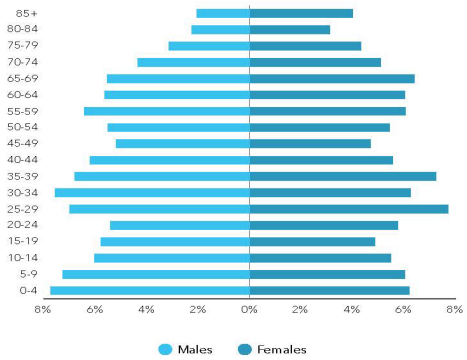


Bars show comparison to Missouri

Bars show comparison to Missouri

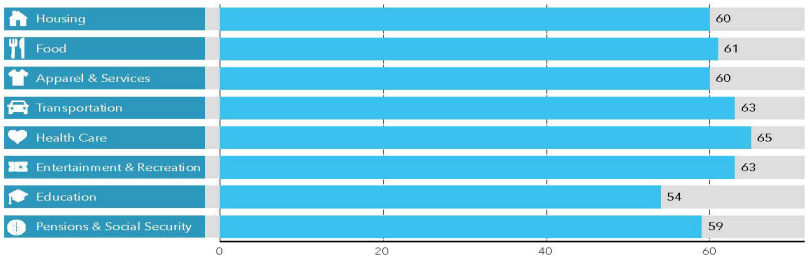
AGE BY SEX

Median Age: 39.0



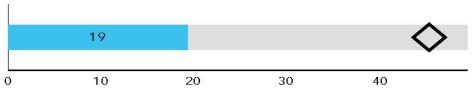
AVERAGE HOUSEHOLD BUDGET INDEX

The index compares the average amount spent in this market's household budgets for housing, food, apparel, etc., to the average amount spent by all US households. An index of 100 is average. An index of 120 shows that average spending by consumers in this market is 20 percent above the national average.



DIVERSITY

The Diversity Index summarizes racial and ethnic diversity. The index shows the likelihood that two persons, chosen at random from the same area, belong to different race or ethnic groups. The index ranges from 0 (no diversity) to 100 (complete diversity).



Dots show comparison to Missouri

Source: This infographic contains data provided by Esri, Esri-Data Axle, Esri-U.S. BLS, ACS. The vintage of the data is 2022, 2027, 2016-2020.

Fig 2.1.12 ESRI Income Data

Natural Resources + Features

Topography

De Soto was settled in an area of the county with high bluffs carved out by narrow valleys. At its lowest elevation in the Joachim Creek De Soto is 454' above sea level. At its highest point on the Western edge of town along highway 21 De Soto is 740'. Between the lowest point of the City and its highest there is a 286' change in elevation. At the base of the hills, near Main St. De Soto exhibits a steep rise in elevation with retaining walls along the ridges. The topography of the ridges in the East and West of the City create a funnel between the two through which the Joachim Creek flows. Additionally, berms have been placed by the railroad in the last few years which accentuate the flow and cause points of constraint for the creek near the Union Pacific rail yard. The condition of the hills and topography also create excess runoff which flows into the Joachim creek with little infrastructure to control the flow at which water moves and enters.

(FIG. 2.1.15)

Hydrology

Four tributary streams flow through De Soto and into the Joachim Creek. These tributaries are used by the city as open channels to carry stormwater down. Additionally, at the southern end of the City near Walther's Park there is a convergence of two additional creeks into the Joachim Creek. The combined flow of water from tributary streams intensifies the flooding condition in the City. That condition is strengthened since several of these tributaries upstream have large subdivision type developments whose stormwater also runs off into the Joachim Creek and eventually through the City of De Soto.

Flooding along tributaries and the Joachim Creek affects several properties and critical facilities in De Soto including (Fig 2.1.16):

- 354 homes (15% of homes)
- 30 miles of city roads (29% of road surfaces)
- 109 commercial properties (56% of businesses)
- An electrical substation
- Government and emergency facilities
- Main St. De Soto
- Union Pacific Railroad
- Parks and Recreational Amenities

When water is flowing through the city in a flash flood situation (the typical condition) it can reach speeds of up to 18ft/sec and 9-11ft in water depth.

The tributary channels designated to carry water down to the Joachim are often full of debris and are inconsistent in depth and width along their trajectories accentuating the flooding conditions and intensifying the reach of the flood along them. (Fig 2.1.13-2.1.14)

Ecological Significance

According to data from the East West Gateway Council of governments the areas of greatest ecological significance in De Soto are along the highway 21 corridor and middle Joachim Creek. Several of the tributaries also present ecologically significant landscapes including the Tanyard Branch and County Tributary. (Fig 2.1.17)

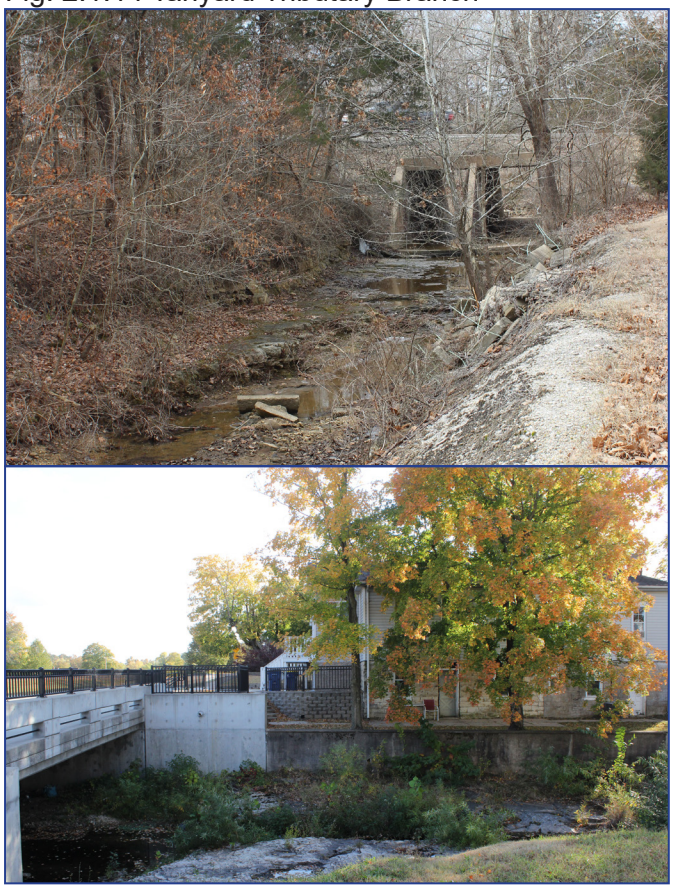
Built Feature Characteristics

City Structure

De Soto is founded along the banks of the Joachim Creek which runs on the Eastern side of the City. Main St. De Soto, the historic center runs parallel to both the Creek and the Union Pacific Railroad for which it was founded. The modern day commercial and retails center has developed in the Western side of the City of De Soto at the top of the hills along highway 21 one of two highways along with highway 110 which grant the primary ways into the City of De Soto. There are six key streets running from Highway 21 to Main St. De Soto linking the neighborhoods in between.

Fig. 2.1.13 County Tributary Branch

Fig. 2.1.14 Tanyard Tributary Branch



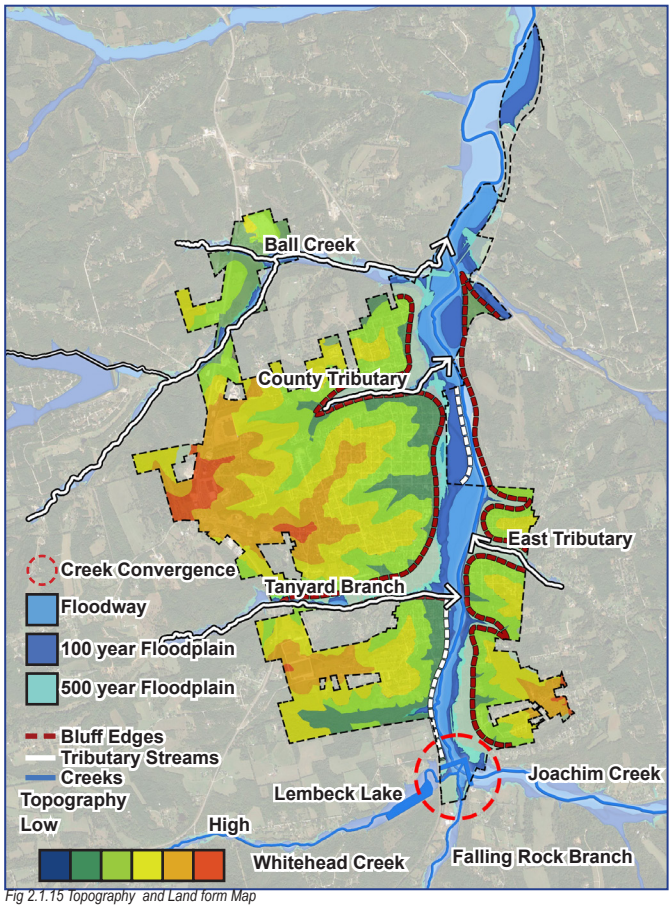


Fig 2.1.15 Topography and Land form Map

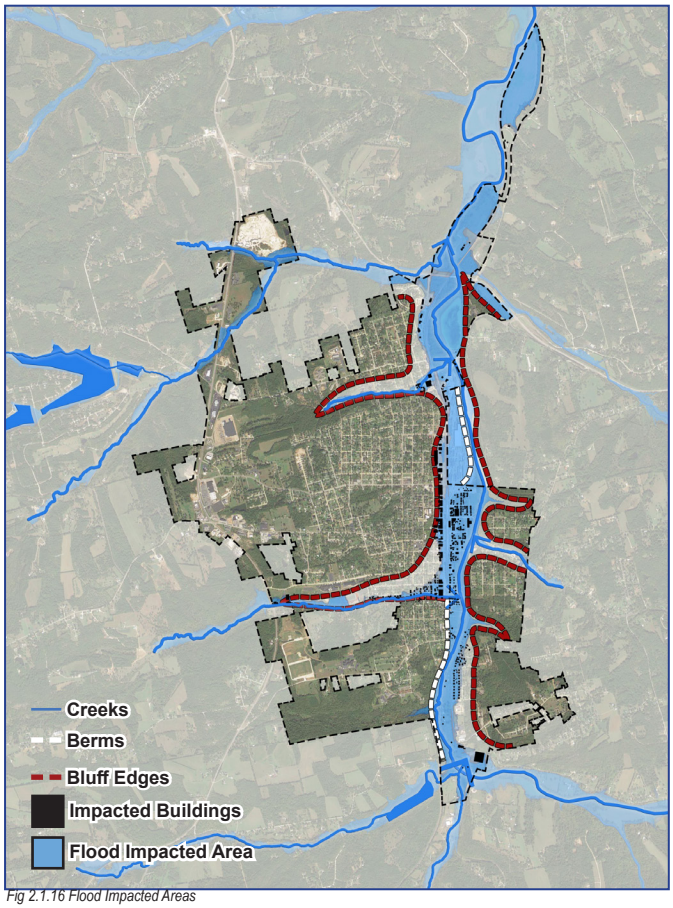


Fig 2.1.16 Flood Impacted Areas

They are:

- Clarke Street
- Boyd Street.
- Rock Road which becomes W Miller Street
- Amvets Drive
- Veterans Dr
- Vineland School Road which becomes Main St.

These are the primary routes between areas of the city and that routes that serve as the Cities major emergency service and access roads in times of emergency.

Streets and Mobility, and Connectivity

Highway 21 and Highway 110 are considered principal arterial routes, Main St. Highway N, and Veterans Dr. are considered Minor arterial routes, Clarke St., Boyd St., Amvets Dr., Vineland Rd., and Flucom Rd. are considered major collector routes, and Donnelly St. and 2nd St. are considered minor collectors. Of all these roads, Missouri Department of Transportation operates and maintains Highways 21, 110, N, and Veterans Dr. The City of De Soto maintains and operates all other roads inclusive of neighborhood routes.

The most heavily trafficked routes in De Soto are the two highways 21, N, and 110 which see approximately between 7,200 to 12,700 vehicles on average a day. These three routes are major regional connectors to other parts of the county and state and contribute to access to larger national highways like Interstates 55 and 270, highway 67 and MM. Internally, to De Soto Veterans Dr., Main St., Boyd St. and Fountain City Rd are the most heavily trafficked routes with an average of between 4000 to 5600 vehicles in a given day. These roads make up the key transportation and access routes to different areas of the City of De Soto.

There are only three roads that cross the railroad into the Eastern part of De Soto - Fountain City Rd, Commercial St, and W Miller St. of those three only one road: W Miller St. crosses the Joachim Creek to allow access to Eastern De Soto in times of emergency need.

While several of the key roads offer sidewalks in De Soto, none of the neighborhood streets have pedestrian facilities. De Soto only offers a trail internal to Walther Park and a bike trail from highway 21 ending halfway down Boyd St. Additionally, connectivity via public transportation only focuses on the core central loop of the city with 4 stops every 2 hours at The De Soto Apartments, City Hall, Sycamore Hills, and the Walmart on Highway 21.

City Stormwater Infrastructure

Over the last decade De Soto has been lining and repairing its stormwater infrastructure using CDBG funds granted by the Jefferson County Economic Development corporation and they plan on continuing with the repairs. The work being completed is to improve the strength of the overall stormwater system and allow it to function at its highest ability even in times of critical rain events where the height of the creek and topographic conditions can contribute to limited capacity and performance leading to localized flooding. Additionally, several culvert bridges create choke points for the flow of tributaries and the Joachim Creek and increase concerns among residents for bridge infrastructure due to erosion, cracking, and debris back ups.

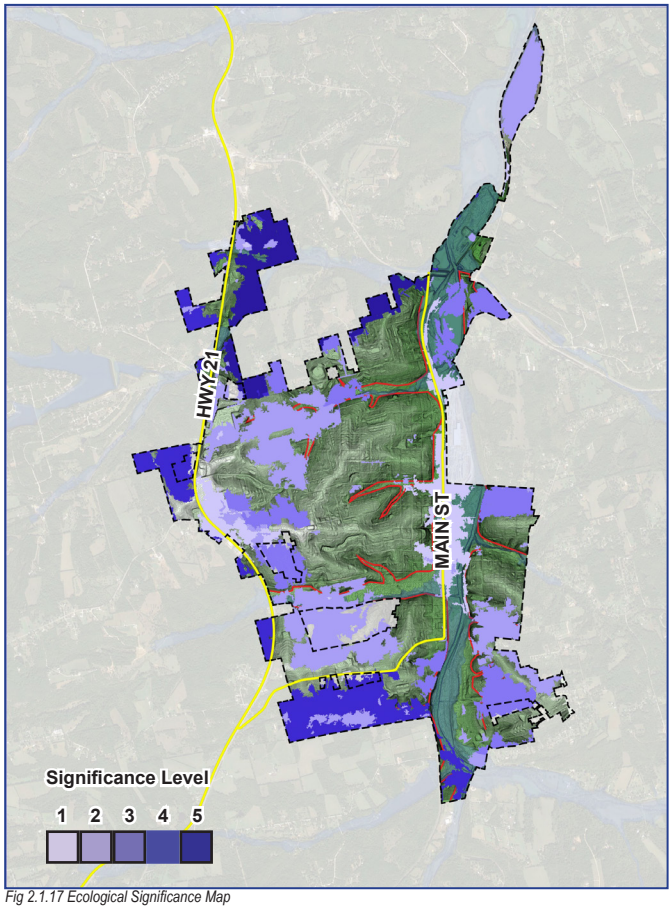


Fig 2.1.17 Ecological Significance Map

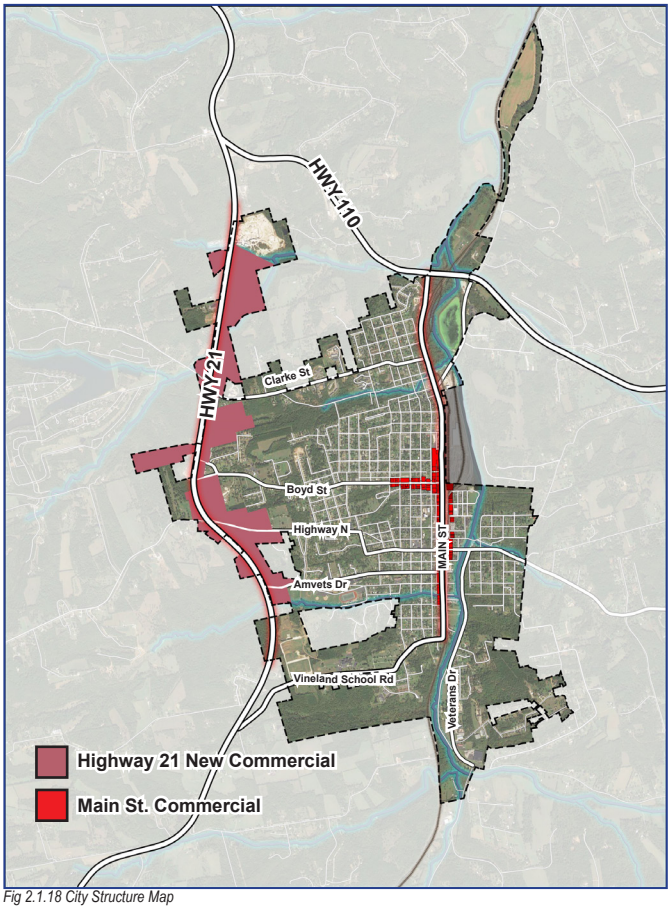


Fig 2.1.18 City Structure Map

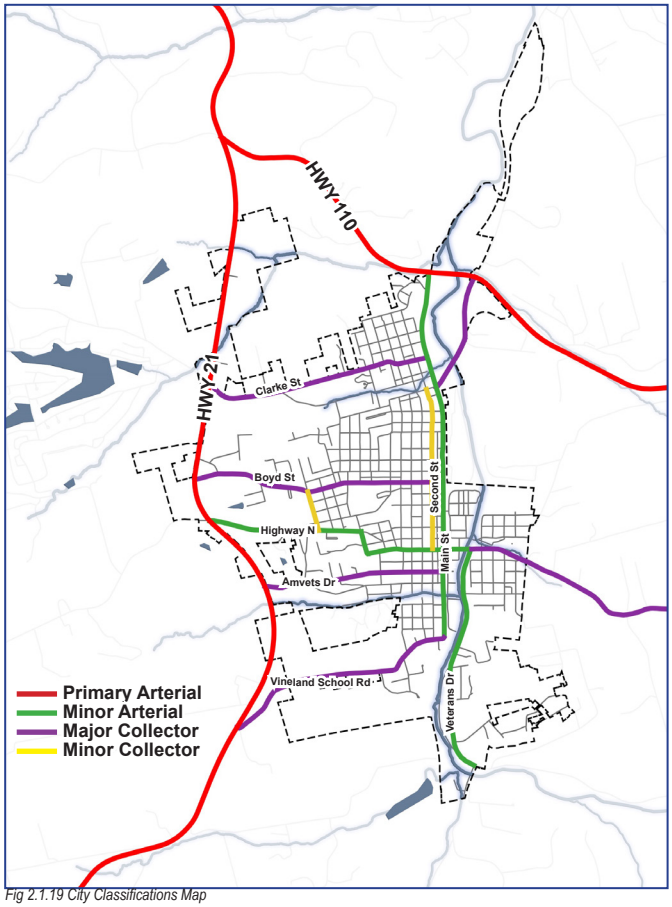


Fig 2.1.19 City Classifications Map

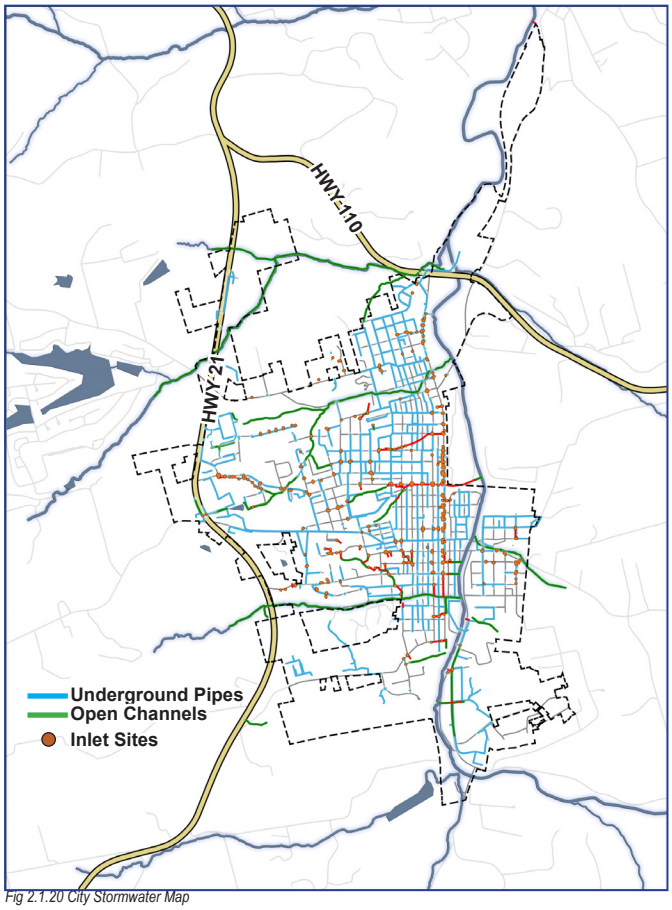


Fig 2.1.20 City Stormwater Map

City Facilities

De Soto has 2,635 structures within city limits. Of those 2,635 - 2,438(91% of structures) are single family detached housing. Commercial structures make up approximately 7% of remaining structures and the remaining 2% are divided among critical social and institutional infrastructure. De Soto has:

- Senior living facilities
- A community center
- A public library
- 7 educational and care facilities including daycare and schools
- An ambulance station
- A police station and two fire stations
- Water towers
- Stream Gage

Several of these facilities double up as shelters in time of need but De Soto lacks substantial medical care facilities for residents and the nearest one is in Festus, a 20-30 minute drive away from the City.

Parks and Recreation

De Soto operates 10 parks within City limits equaling 88.5 acres. Per NRPA standards De Soto only needs to provide 63 acres for its population and is over performing in park development. Nearly all households fall within a 10-15 minute walk from a public city park. Parks are a critical amenity to the City that residents feel contribute positively to their everyday quality of life.

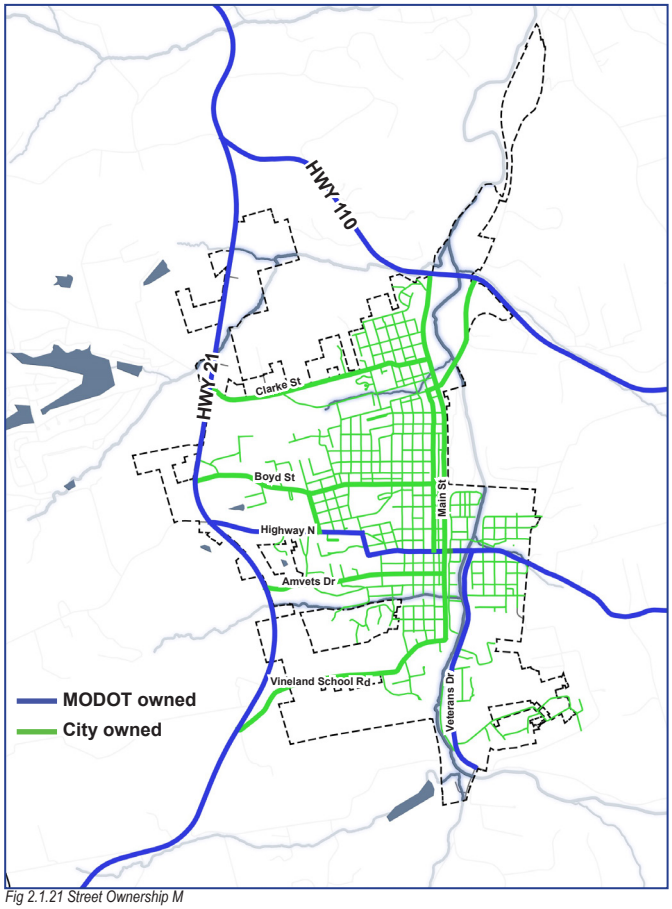


Fig 2.1.21 Street Ownership M

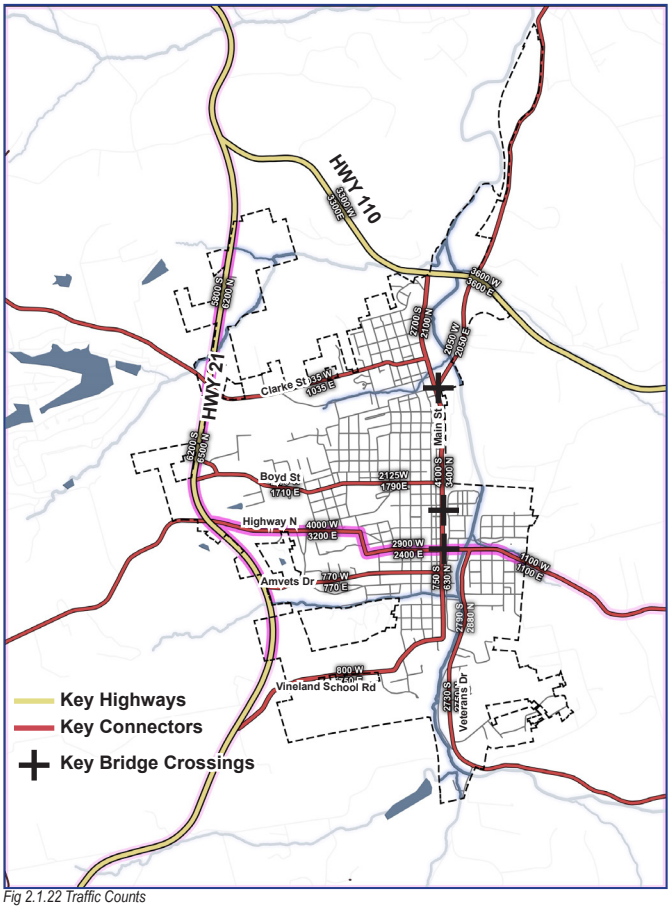


Fig 2.1.22 Traffic Counts

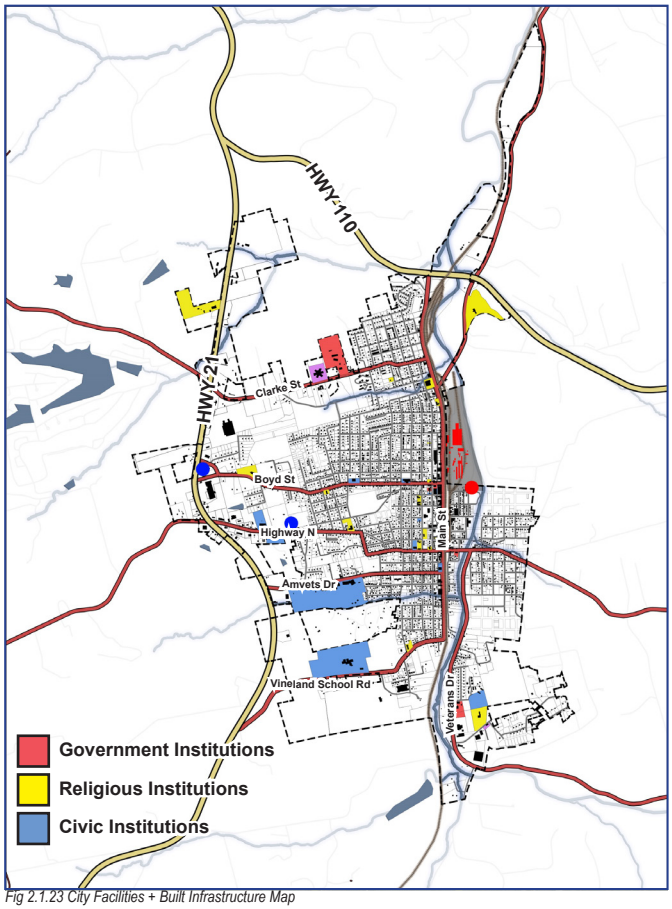


Fig 2.1.23 City Facilities + Built Infrastructure Map

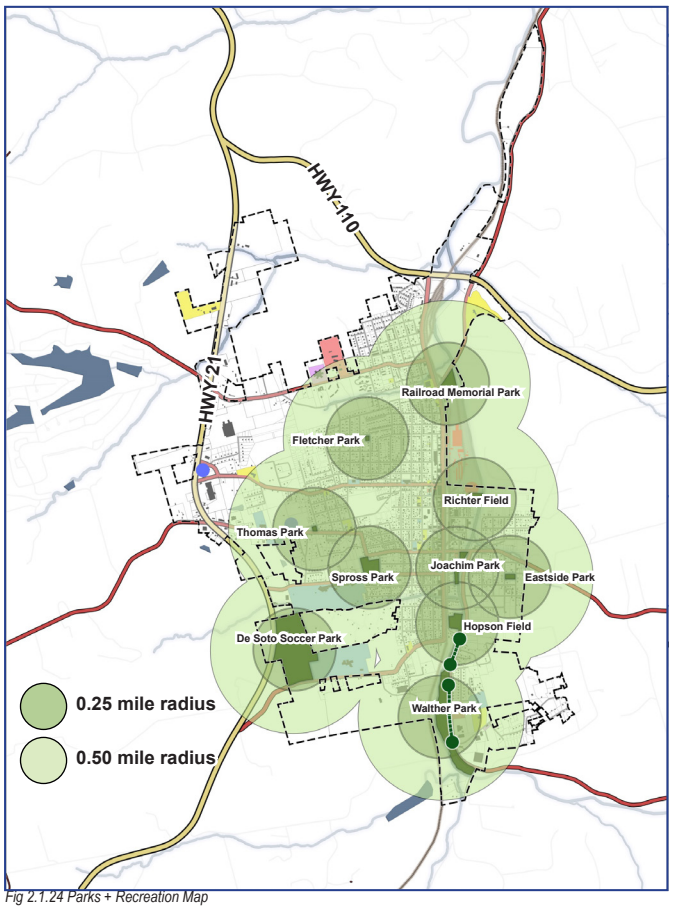


Fig 2.1.24 Parks + Recreation Map

Zoning and Land Use Classifications

De Soto is primarily a residential community. The following maps represent the existing land use and zoning classifications of the City. The City does not currently have a Comprehensive Plan and therefore it does not have a future land use map.

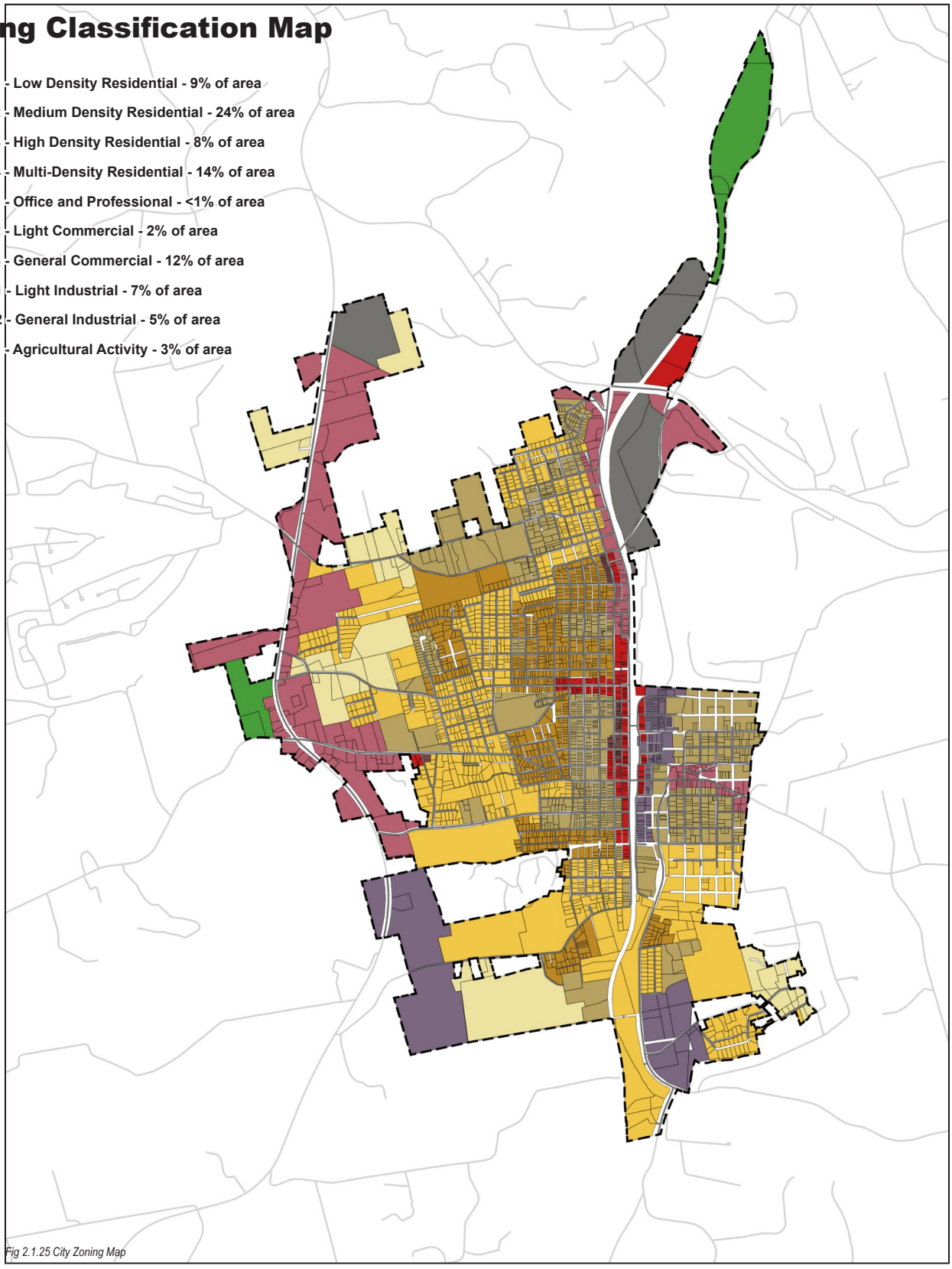


Fig 2.1.25 City Zoning Map

De Soto is zoned for 55% residential uses, 15% for commercial uses, 12% for industrial uses, and 3% is zoned agriculture. Approximately 15% is occupied by right of way. The areas zoned along the Joachim Creek are higher density allowances with greater impervious surface coverage contributing to adverse flood effects.

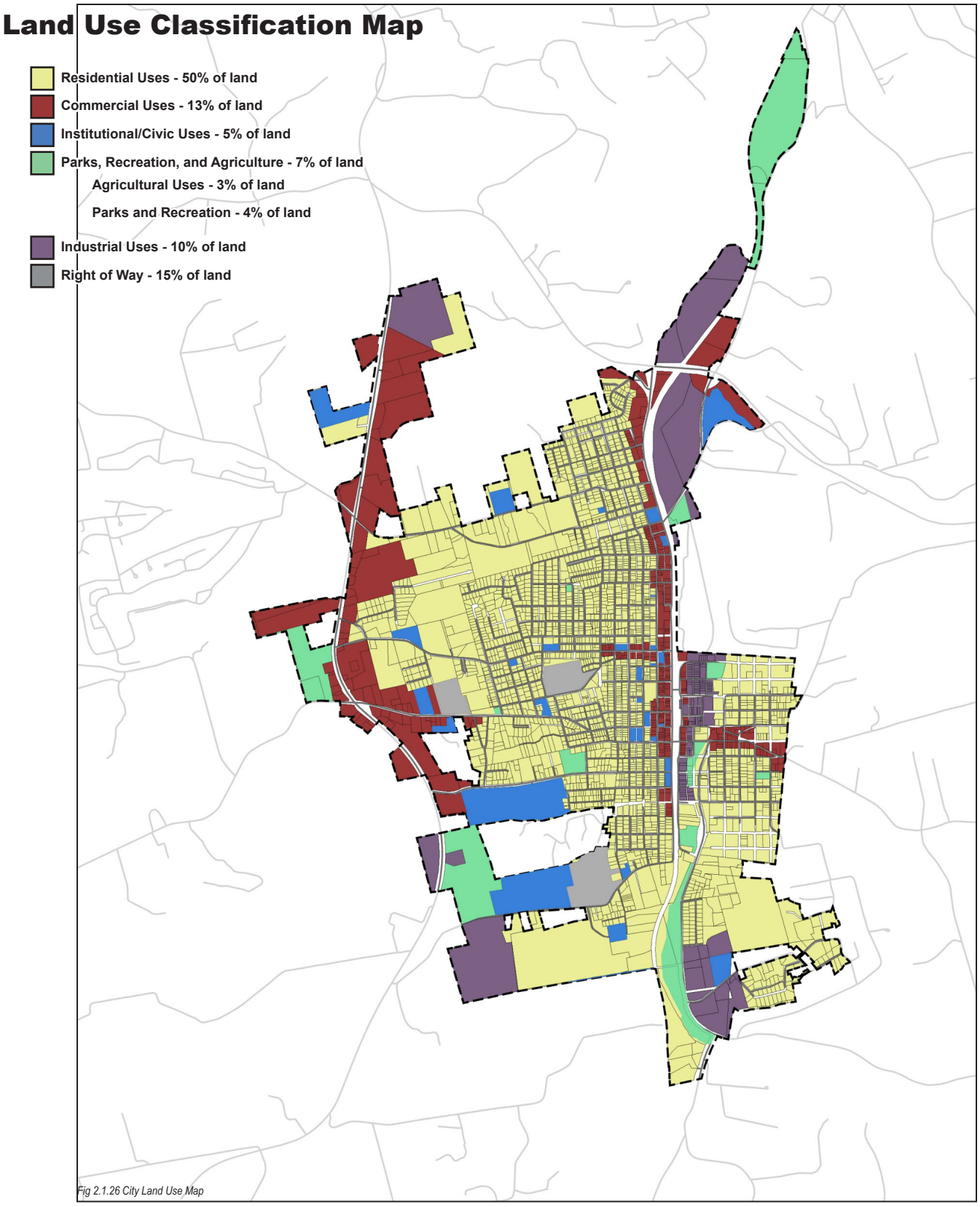


Fig 2.1.26 City Land Use Map

Economic Overview

Population Trends

Of the 15 counties in the St. Louis Metro Area Jefferson County is the sixth most populous. Within the municipalities of the county De Soto is the third most populous with 6,435 people. In general, De Soto's population had steady growth jumping heavily in 1990 but leveling out since 2000. The population has increased 11% since 1960.

While Jefferson County experienced 225 percent population growth between 1960 and 2020, the unincorporated portions of the county (that is, outside of the various cities) expanded 249 percent. Unfortunately, De Soto seems not to have shared in the growth, most of which has been in the northern part of the county.

Much of the growth in the incorporated cities and villages, of course, resulted from annexation of already-populated areas, so unincorporated growth is a substantial contributor to the county's residential expansion.

Meanwhile, the population of the 15-county metropolitan area increased only 25 percent from 1960 to 2020.

Housing Market Analysis

This section of the plan assess a variety of factors of the De Soto market by drawing comparisons between the conditions of the rest of De Soto and the conditions of the Main to Creek corridor in De Soto which is the primary flood affected area of the city.

Housing Vacancy and Homeownership

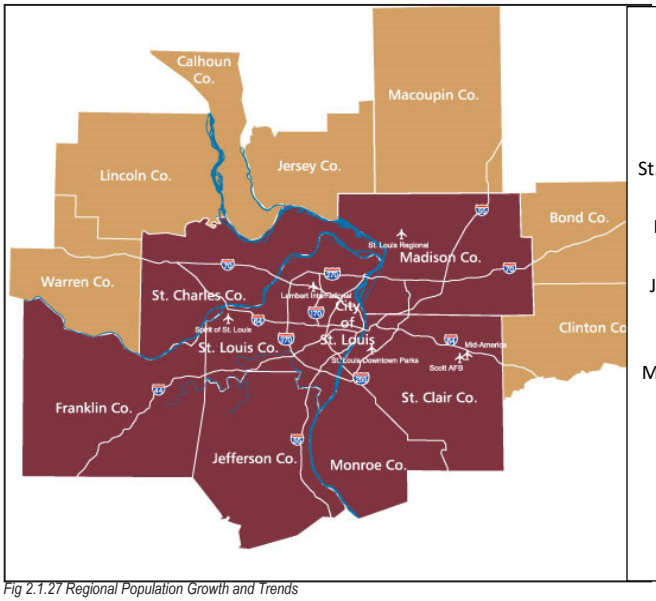
De Soto has a relatively high housing vacancy rate compared to several of its Jefferson County peers. The Main Street-to-Joachim Creek corridor has almost double the city's vacancy rate. There are an estimate 205 housing units in the study corridor, over a quarter of which are vacant, compared to about 14 percent vacant in the rest of the city. All of those rates are higher than in peer cities and the county as a whole.

Despite high vacancy rates, De Soto—and even the Main-to-Creek corridor—has a strong homeownership rate. This measures the percent of housing units that are occupied by their owners, unlike dwelling units occupied by renters. In fact, the study corridor has a higher rate than the rest of the city. The county as a whole as a very high homeownership rate of almost 80 percent. The national average is about 66 percent.

Housing Age

De Soto's housing stock is comparatively old when compared to all of Jefferson County, reflecting slower population growth. Measured against all of Jefferson County, De Soto's housing is dominated by structures built before 1960. The graph depicts the location quotient of the city within the county. A value of "1.0" means that the percent of housing in De Soto for that time period is the same as the county's percent. Higher LQs reflect higher shares than the county. Four out of ten De Soto housing units (41.3%) were built before 1960, compared to 15.3% in the county and 27.0% in the entire U.S.A. The median year built of all housing in De Soto is 1970, compared to 1984 in Jefferson County and 1977 for the entire country.

The Main-to-Creek corridor's housing stock is also comparatively old when compared the County, but slightly "younger" than in the rest of the city. The corridor's housing is dominated by structures built before 1950. The graph depicts the location quotient of the corridor within the county. A value of "1.0" means that the percent of housing in the corridor for that time period is the same as the county's percent. Higher LQs reflect higher shares than the county.



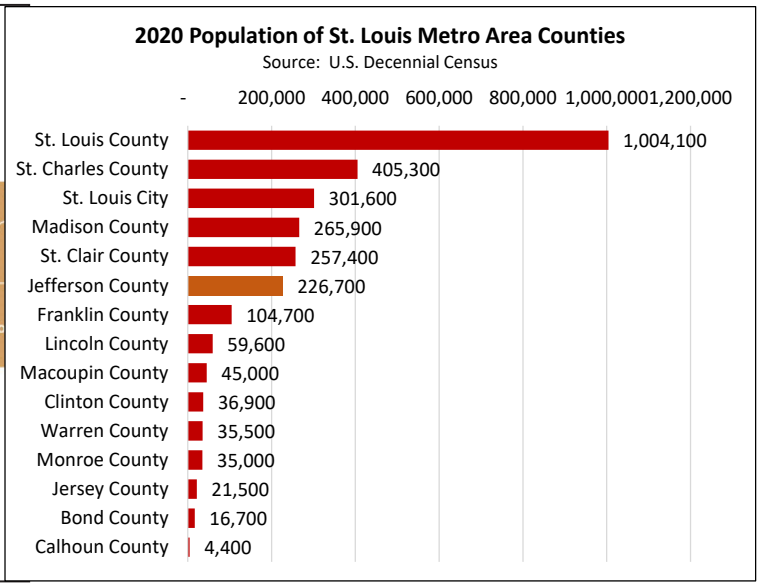
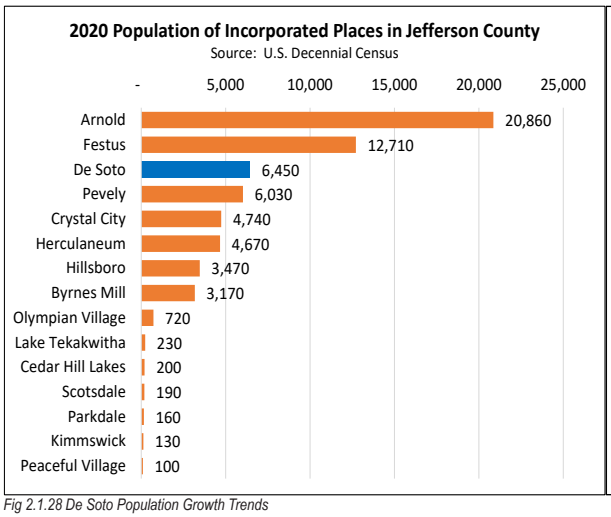


Fig 2.1.27 Regional Population Growth and Trends



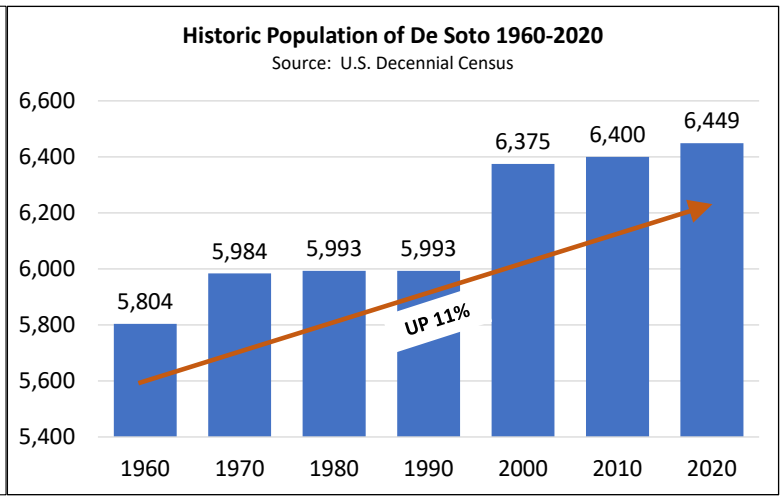
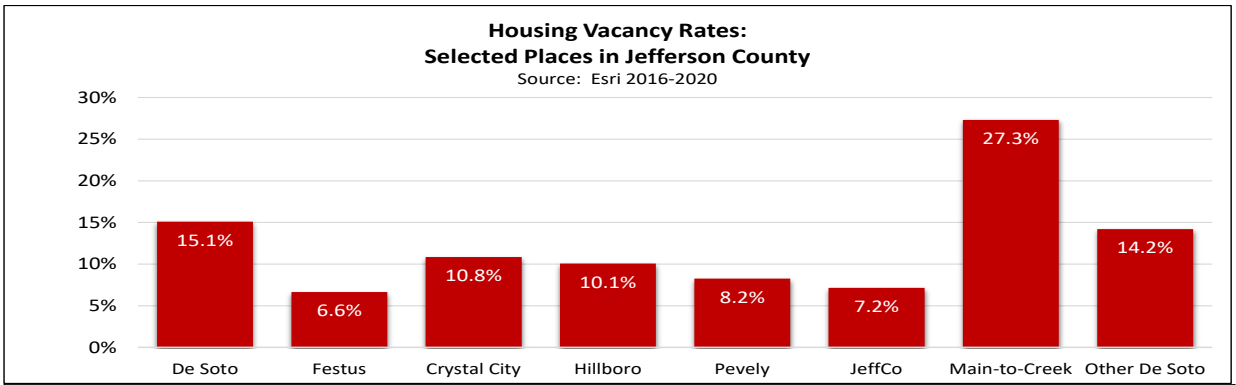


Fig 2.1.28 De Soto Population Growth Trends



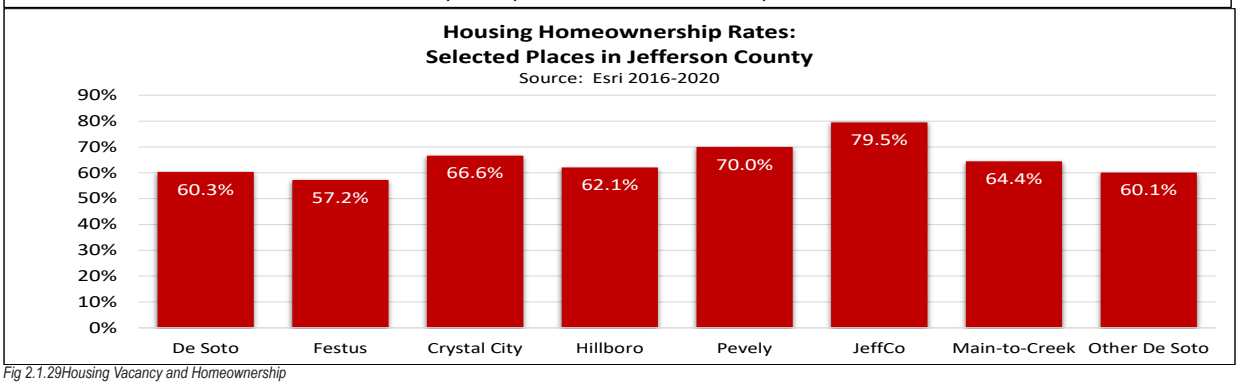


Fig 2.1.29Housing Vacancy and Homeownership

Almost four out of ten corridor housing units (37.6%) were built before 1960, compared to 15.3% in the county and 41.3% in De Soto as a whole. The median year built of all housing in Main-to-Creek Corridor is 1973, compared to 1970 in De Soto and 1977 for the county.

Contract Rents and Affordability

De Soto has the most affordable housing—or the least valuable. But comparing incomes to values, De Soto appears relatively affordable. The ratio of household income in De Soto to the median housing value is 0.44. A higher ratio would mean that housing values are more affordable relatively to income, lower ratios suggest challenges for local households (i.e., it takes more income to afford the housing). De Soto's ratio is all but "normal" in comparison, indicating that—for lower income households such as found in greater percentages in De Soto—housing is affordable. It's not the most valuable housing in the county, but it is valued to match the buying power of De Soto households.

De Soto's contract rent for renter-occupied housing is comparatively low when compared to all of Jefferson County. Measured against the county, De Soto's rental housing, comprising one out of four occupied units, is actually dominated by monthly rents between $550 and $749, but the city has a much higher share of rents below $250 when compared to the county. This keeps overall rents rather low, with a median of just $600 per month. Median rent in Jefferson County is $677, almost 13% higher than in De Soto. Moreover, De Soto's median is also lower than in the Main-to-Creek Corridor at $612.

Rents in the Main-to-Creek study corridor are also comparatively low but the concentration is such that the median is higher at $612 per month than in the city of as a whole ($600). Almost half (48.7%) of the units in the corridor that have contract rents fall between $550 and $749, about 43% higher than in the county as a whole. Still, the corridor has a substantially higher LQ for the "less than $250" category, which keeps the median rent at only about ten percent lower than throughout the county.

For the rental market, De Soto might, in fact, be a bit less affordable than for homeownership. The city's ratio of median income to median rent is 81.7. Again, a lower ratio would indicate that it takes more income to afford the rent. Herculaneum is the most obvious example. But the next lowest is De Soto. All the other places, and the county as a whole, have income-to-rent ratios higher than De Soto, indicating that they may be more affordable for renters than De Soto and Herculaneum. In other words, renters in De Soto may have a harder time affording housing than households able to buy their housing units.

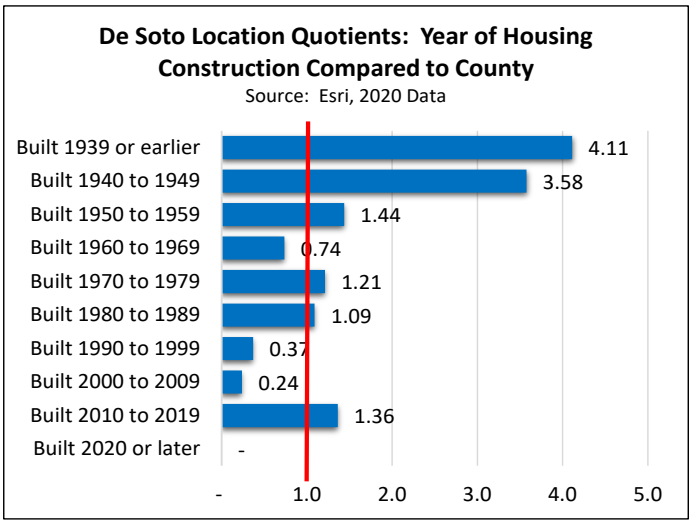


Fig 2.1.30 Year of Housing Built in De Soto

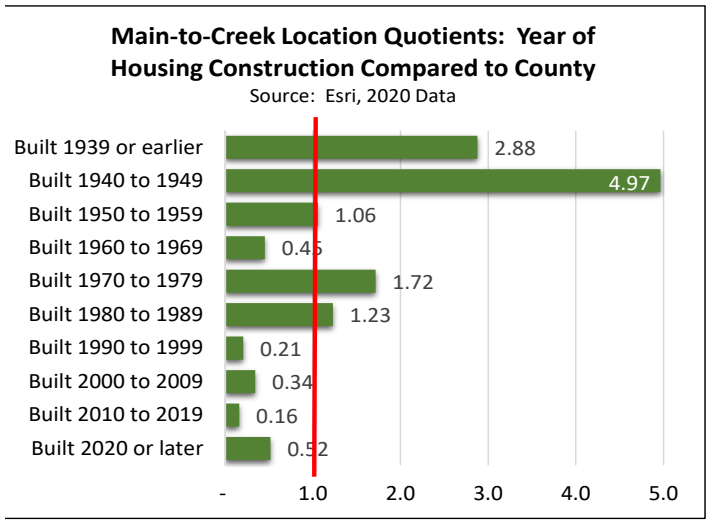


Fig 2.1.31 Year of Housing Built in De Soto Main to Creek Corridor

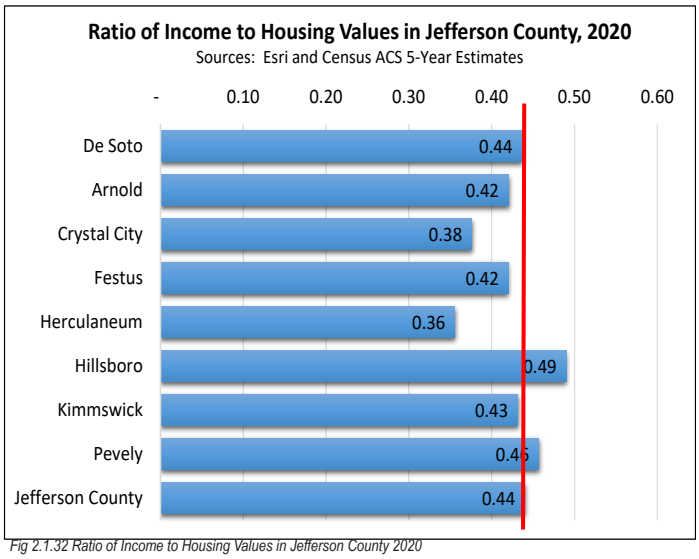


Fig 2.1.32 Ratio of Income to Housing Values in Jefferson County 2020

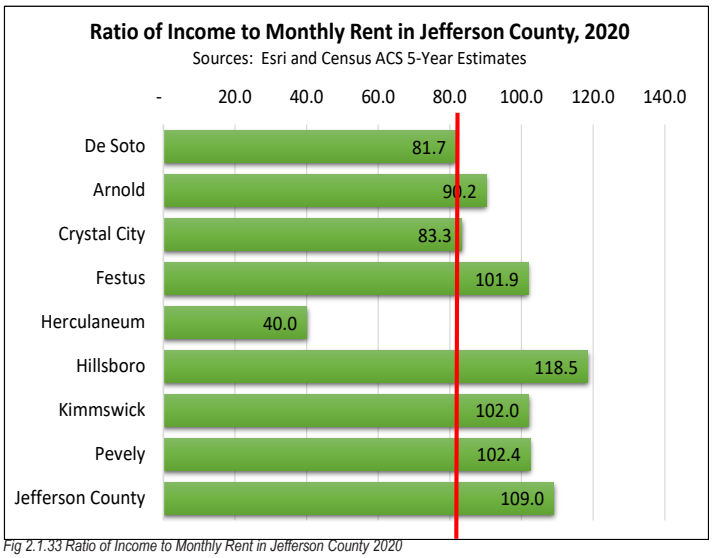


Fig 2.1.33 Ratio of Income to Monthly Rent in Jefferson County 2020

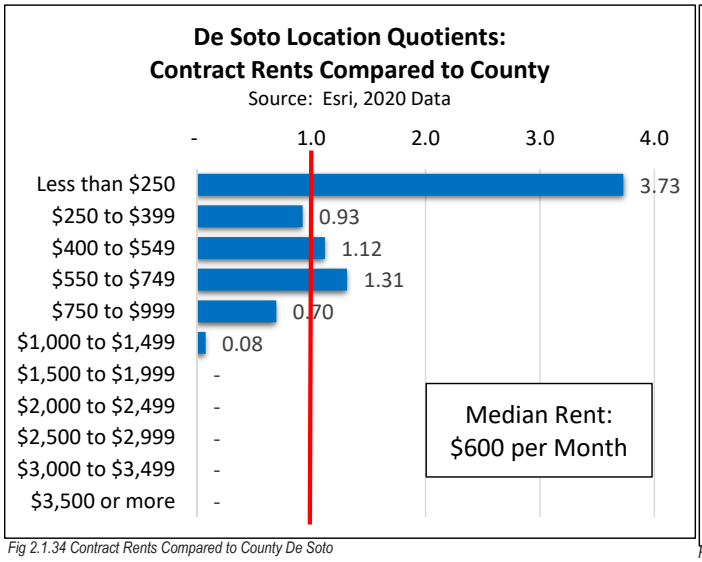


Fig 2.1.34 Contract Rents Compared to County De Soto

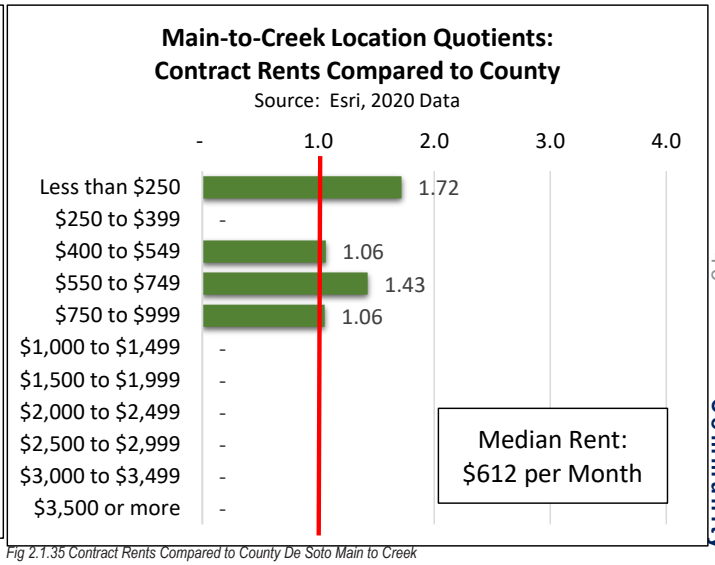


Fig 2.1.35 Contract Rents Compared to County De Soto Main to Creek

Home Values

De Soto has much higher shares of owner-occupied housing units that are valued between $50,000 and $150,000 than in Jefferson County as a whole. Location quotients in these two value ranges significantly exceed 2.0 while all other LQs fall below 1.0. Three quarters (75.0%) of all owner-occupied housing in the city falls into that $50,000 to $150,000 range, compared to less than a third in the county. This keeps the median value relatively low in De Soto at about $112,200, about two thirds of the county's median of $167,700. The city has no housing with values exceeding a half million dollars, while the rest of Jefferson County has almost 1,300 in this range.

The median is markedly lower in the Main Street to Joachim Creek corridor at $100,900, some ten percent less than throughout De Soto and just 60 percent of the county median. Four out of ten (39.2%) of the 96 owner-occupied housing units in the Main-to-Creek corridor fall in the value range of $50,000 to $100,000. This percent is 3.65 times the percentage for the entire county in this value range. Almost another quarter (22.7%) of the corridors owner-occupied units fall in the $100,000 to $150,000 range. The corridor has no units with values exceeding a half million dollars.

The average housing value for the 96 units that are recorded as having values in the Main Street to Joachim Creek corridor is estimated by Esri to have been $114,200 in 2020, considerably higher than the median of $100,900. This suggests that the corridor has a few more highly valued housing units which increases the average over the median. An average of $114,200 indicates that the overall value of the 96 housing units is approximately $11 million. In 2023, given inflation of the intervening three years, that aggregate value is probably closer to $12.7 million, or an average of $132,300.

On a topside assumption that all other housing units in the corridor have the same market value (that is, those that are presently occupied by renters plus those that are vacant), the aggregate value of all housing in the Main-to-Creek corridor is about $27 million.

The median value of owner-occupied housing in the city of De Soto increased from $67,200 in the year 2000 (Census data) to $102,500 in 2010 and $112,200 in 2020.Median value increases strongly exceeded the rate of inflation between 2000 and 2010. The median value in De Soto increased by 67% while inflation advanced only 26%.Fortunes reverse in the subsequent decade. The median value of homes in De Soto grew just nine percent over ten years but inflation was roughly double that.

Probably a major contributing factor to the relatively slow increase in median housing value between 2010 and 2020 was a three percent net decline in median household income in De Soto during that time—even accounting for inflation. But median household incomes decreased even more rapidly between 2000 and 2010. The inflation-adjusted median income in De Soto decreased by 13% in that decade. Reduced household incomes, overall, contributes to an inability to afford higher prices or rents in the housing market. This results in depressed prices and rents as the market adjusts over time.

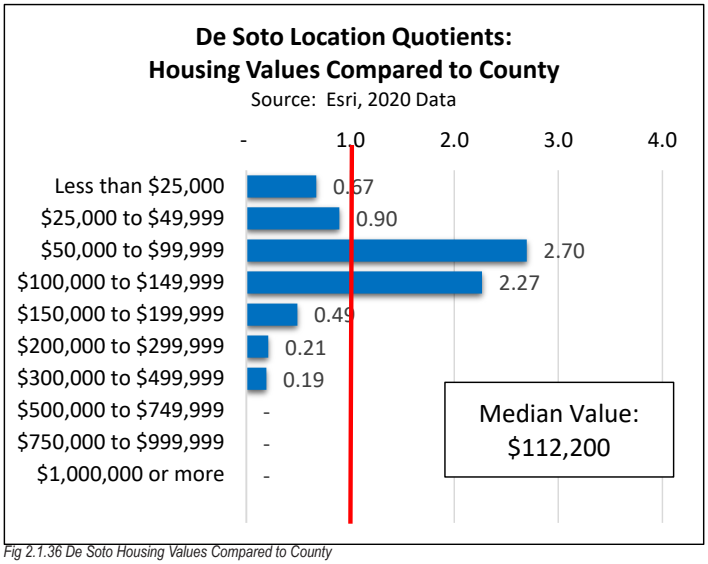


Fig 2.1.36 De Soto Housing Values Compared to County

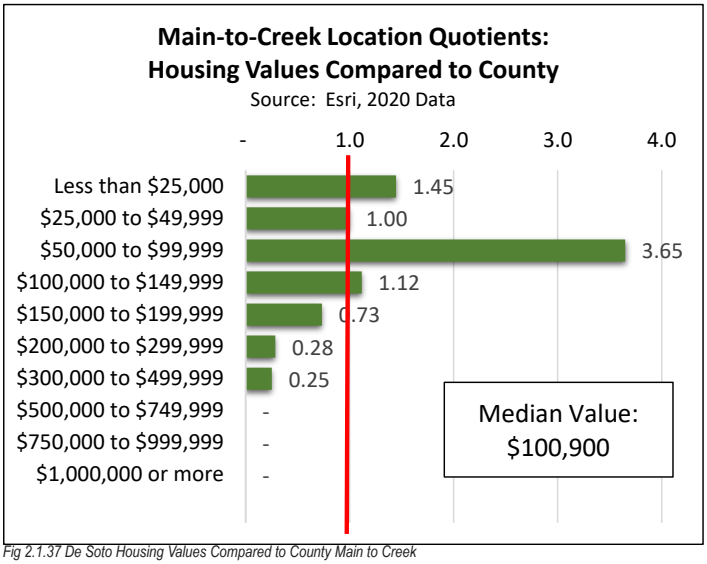


Fig 2.1.37 De Soto Housing Values Compared to County Main to Creek

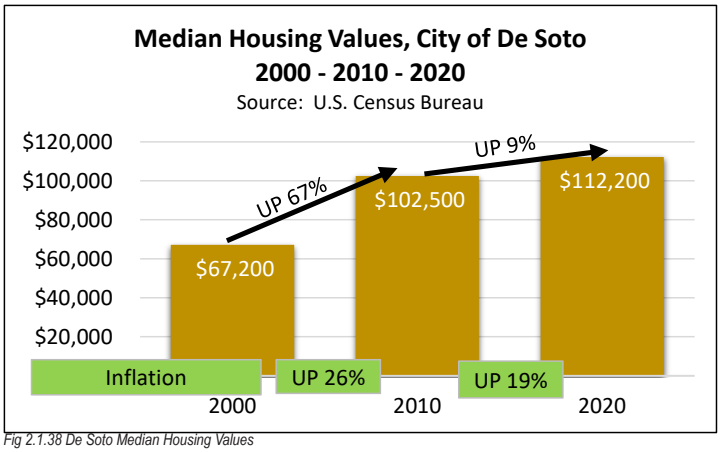


Fig 2.1.38 De Soto Median Housing Values

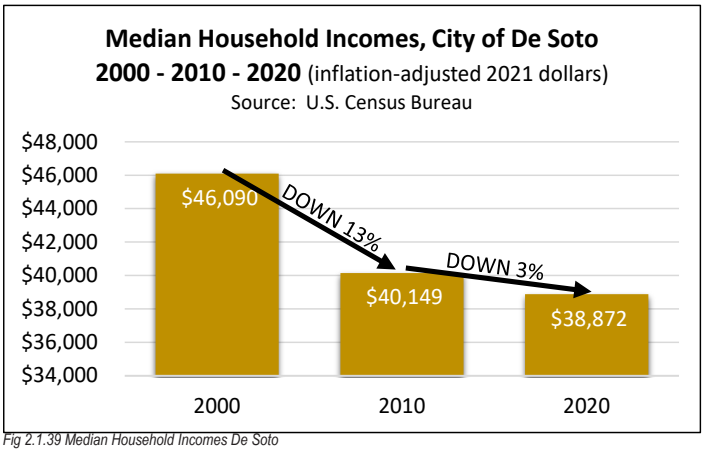


Fig 2.1.39 Median Household Incomes De Soto

Fig 2.1.40 Example De Soto Housing Stock

Fig 2.1.41 Example De Soto Housing Stock

Economic Conditions of De Soto

Commuting Patterns

De Soto is a "net bedroom community." More residents leave the city for jobs elsewhere than commute into the city for jobs. But the differences in commuting aren't particularly large. Almost 2,300 De Soto residents commuted to jobs in other places in 2019. They were not quite replaced by almost 2,100 in-commuters taking jobs in De Soto (again excluding jobs at Union Pacific).

Using these data, there were 2,431 jobs in the city in 2019. Of these jobs in De Soto, 358 were held by De Soto residents (15%) while 2,073 were held by outsiders (85%). The "daytime" population of De Soto was smaller than its "nighttime" population. This imbalance is more pronounced for the entire county. About 82,700 JeffCo residents left the county for jobs in 2019 on an average day, compared to 23,200 commuting into the county from other places. But 25,600 JeffCo residents stayed within the county for their jobs.

Out-commuters from De Soto brought home higher earnings in 2019, on average, than those who work in De Soto. Almost four in ten (39.1%) out-commuters earned more than $40,000 per year from their jobs, the highest of three earning categories of this Census Bureau database.

Just over a quarter (26.9%) of the people commuting into De Soto for jobs earned over $40,000, while only about a fifth (21.5%) of those who both live and work in De Soto earned that much. In short, jobs in De Soto are relatively low-paying (again, excluding the UP jobs) while De Soto residents who live elsewhere bring home higher incomes from their jobs.

The Census Bureau's "On-the-Map" data series shows 2,431 jobs located in De Soto as of calendar year 2019, the latest year for this data series. Unfortunately, this "city data" excludes jobs located adjacent to but outside of the city limits. Hence, the many jobs at Union Pacific are not counted. There has been virtually no growth in jobs in the city since 2002, the beginning of this data series. Meanwhile, Jefferson County added about 6,200 jobs, up 14.6%. This pace outperformed the 8.8% growth in metropolitan area jobs.

By Economic Sector

De Soto's largest job sector is retail trade where over a quarter (26%) of all jobs are found. Unfortunately, this "city data" as provided by the U.S. Census Bureau excludes jobs located adjacent to but outside of the city limits. Hence, the many jobs at Union Pacific are not counted.

De Soto also has a relatively high number of educational service jobs (18% of all jobs), health care and social assistance (16%), and lodging and dining (14%). De Soto captured 5.8% of all Jefferson County jobs in 2002 but this dropped to 5.0% by 2019 given the county's growth and De Soto's stability.

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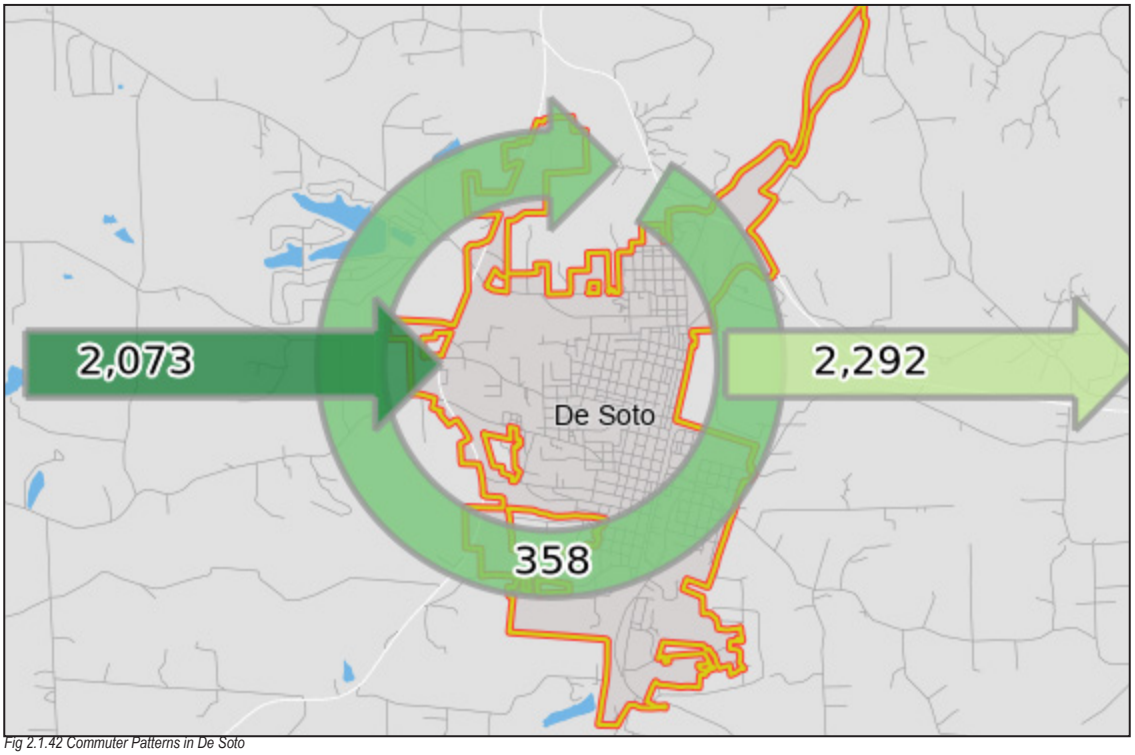


Fig 2.1.42 Commuter Patterns in De Soto

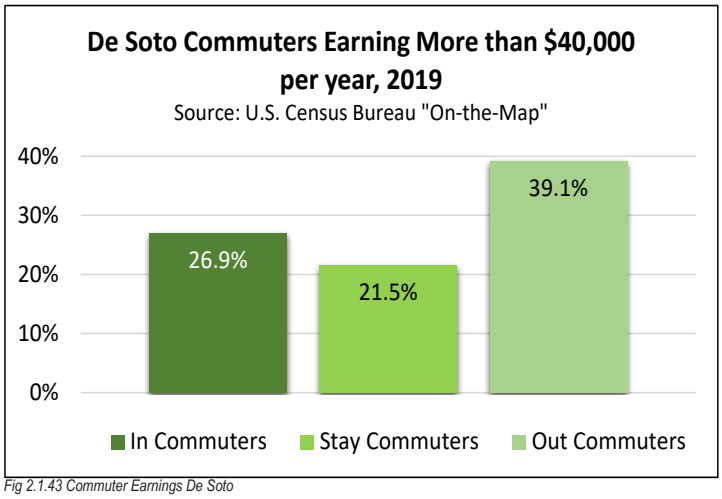


Fig 2.1.43 Commuter Earnings De Soto

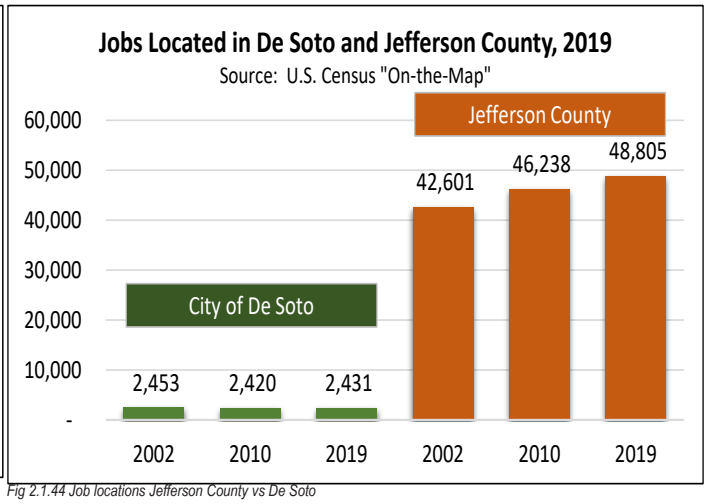


Fig 2.1.44 Job locations Jefferson County vs De Soto

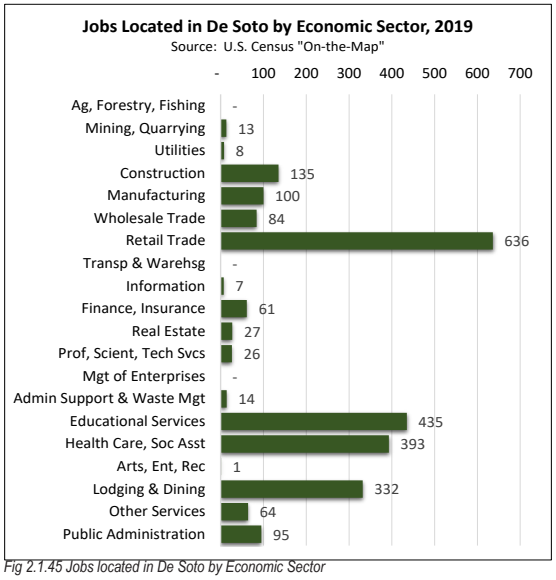


Fig 2.1.45 Jobs located in De Soto by Economic Sector

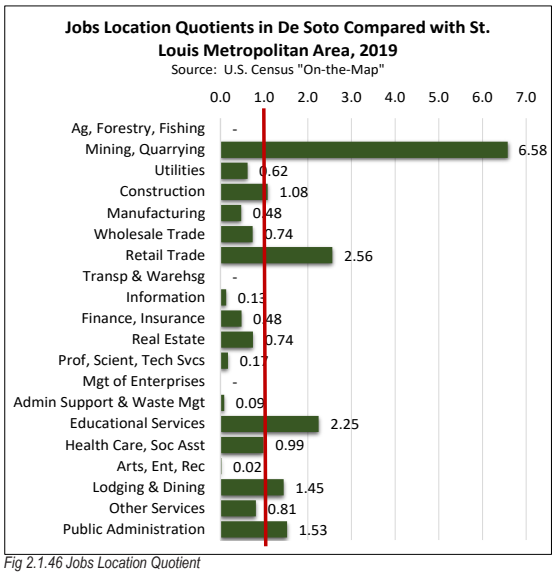


Fig 2.1.46 Jobs Location Quotient

Business and Employment

Esri Business Analyst estimates that there are 308 business establishments in the city of De Soto. This excludes, of course, Union Pacific which is located outside the city limits. It does include, however, public or governmental establishments like city hall and the library. (There are 12 such public establishments in De Soto, four of which are in the Main Street-to-Joachim Creek corridor. Of the 308 businesses throughout the city, 59, or 19 percent, are located in the Main Street-to-Joachim Creek Corridor. The rest of the city contains the other 249 businesses, or 81 percent.

Esri Business Analyst estimates that there are 3,066 employees in the 308 business establishments in the city of De Soto. Again, this excludes Union Pacific. Of those 3,066 employees, 382, or 12 percent, work in the Main Street-to-Joachim Creek Corridor. The rest of the city contains the other 2,684 employees, or 88 percent.

The average business in the Main-to-Creek corridor is considerably smaller than elsewhere in the city. The average business in the Main-to-Creek corridor has 6.5 employees, about 60 percent the size of the average business elsewhere in the city where the typical business as 10.8 employees.

De Soto has no businesses in three of 20 sectors tracked by Esri, and the Main-to-Creek Corridor has no businesses in six of those sectors. Still, the downtown/Main Street area has business establishments in 14 of the 17 sectors represented in the entire city, suggesting that economic conditions in the downtown area are relatively robust.. Again, this excludes the Union Pacific operations, but employment there certainly contributes to the support of some Main-to-Creek businesses.

The Main-to-Creek Corridor averages between 2.0 and 20.7 employees per business establishment. Highest averages are found in the education services (20.7) and lodging & dining (13.4). Esri counts five dining establishments in the corridor and no lodging establishments. It also counts three educational services establishments totaling 62 employees.

The rest of De Soto averages between 2.7 and 40.0 employees per business establishment, higher than in the Main-to-Creek Corridor. Like Main-to-Creek, the largest establishments in the rest of the city are in the educational services sector (e.g., schools). Wholesale trade businesses average 32.0 employees in the rest of the city followed by manufacturing at 17.5 per business.

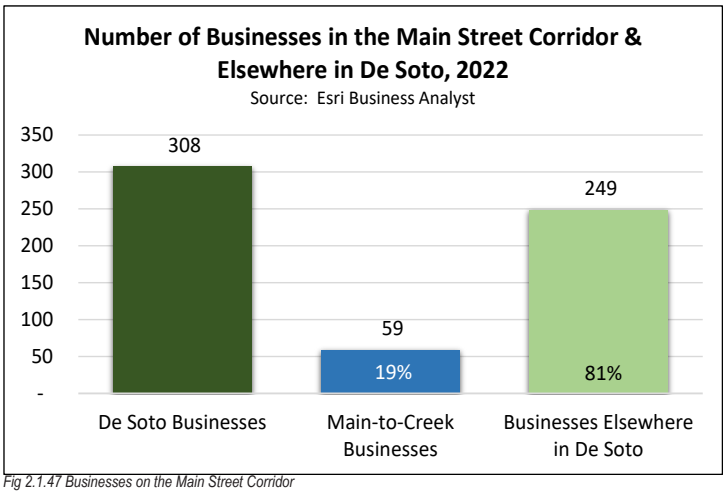


Fig 2.1.47 Businesses on the Main Street Corridor

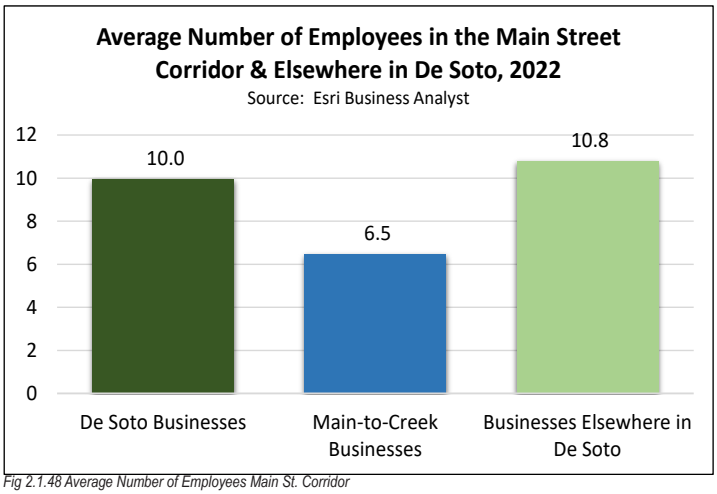


Fig 2.1.48 Average Number of Employees Main St. Corridor

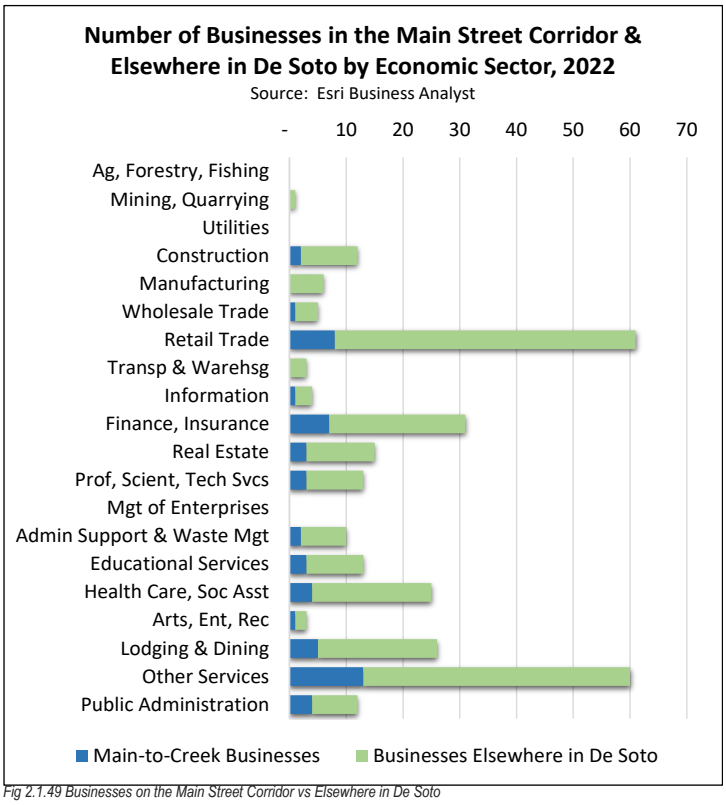


Fig 2.1.49 Businesses on the Main Street Corridor vs Elsewhere in De Soto

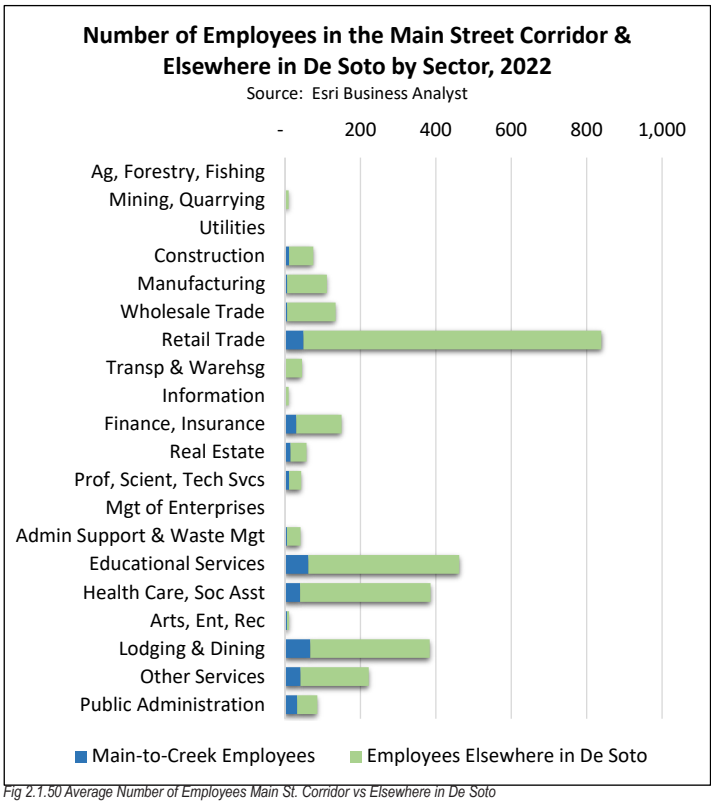


Fig 2.1.50 Average Number of Employees Main St. Corridor vs Elsewhere in De Soto


COFFEE
426
424
JUST
BE
KIND

2.2
PLAN UPDATE

Existing Flood Mitigation Planning

The City of De Soto does not actively have any plans specifically for Flood Resiliency and Hazard Mitigation. While not adopted several other regional and departmental plans encompassing the City of De Soto have been developed in the last decade addressing flood hazard and mitigation as well as general area growth. These plans formed the base line of action items and recommendations of the De Soto Flood Resiliency Planning Process that were reviewed, incorporated, adapted, and vetted through a robust public engagement and city leadership review process.

Planning Document Reviews

Nine relevant plans were reviewed for the planning process to inform the teams understating of De Soto and its projected growth. Of the nine plan, five of them focused on regional and county development but assisted in informing the planning process to understand the context of growth, development, and priorities for outside jurisdictions. These plans were:

- *The St. Louis Regional Hazard Mitigation Plan (2020)*
- *The Jefferson County Master Plan (2003; but undergoing an update)*
- *The Jefferson County Roadway Master Plan (2021)*
- *The MODOT Route 21 Corridor Plan*
- *The Jefferson County Road Safety Plan (2019)*

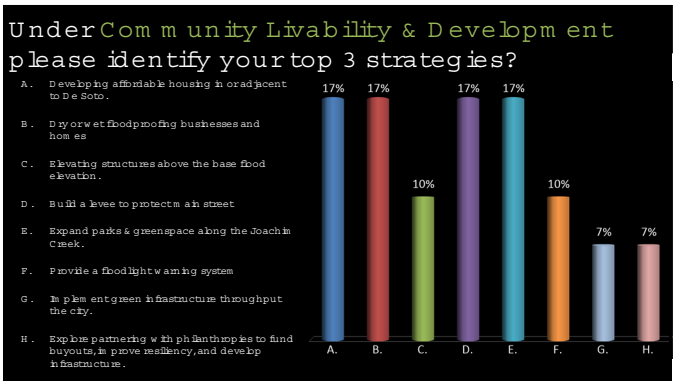
The other four plans encompass De Soto specific areas and were reviewed in the flood mitigation and resiliency planning context for the City. These plans included:

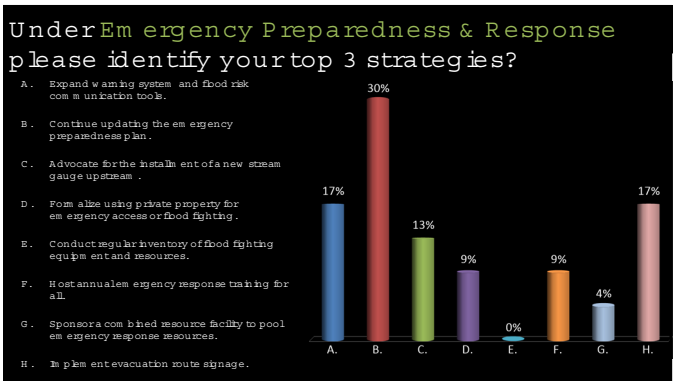
- *USGS 2D Hydraulic Analysis of Joachim Creek Report (2021)*
- *US Army Corps of Engineers (Yellow Jackets) Upper Joachim Creek Flood Plain Management Plan (2019)*
- *The De Soto Emergency Action and Evacuation Plan (2021)*
- *Historic Downtown: Nature Based + Green Infrastructure Flood Resiliency Framework Plan (2021)*

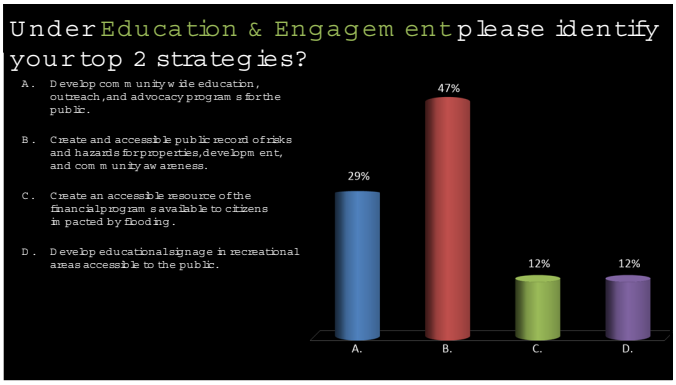
From these four respective plans 38 key recommendations were pulled for review as the foundation of the resiliency plan and ran through the engagement process. While a full report of this exercise and results from meetings can be found in appendix G, the following represents community members priorities of these recommendations and strategies:

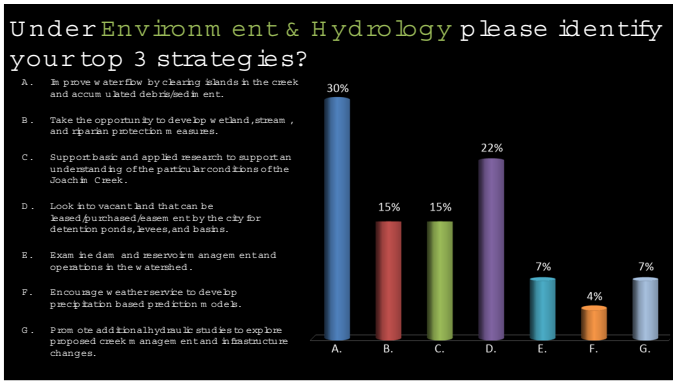
Based on the polling exercise and meeting reviews of the recommendations from the aforementioned plans, these are the key recommendations the community believed to be most important to the planning process. The analysis and feasibility work later determined a few of these recommendations may better serve as objectives and in some cases like the housing and buyout plan initiatives as their own individual plans and reports (Appendices E and F). Priorities being pulled through into the 2023 Flood Resiliency Plan included:

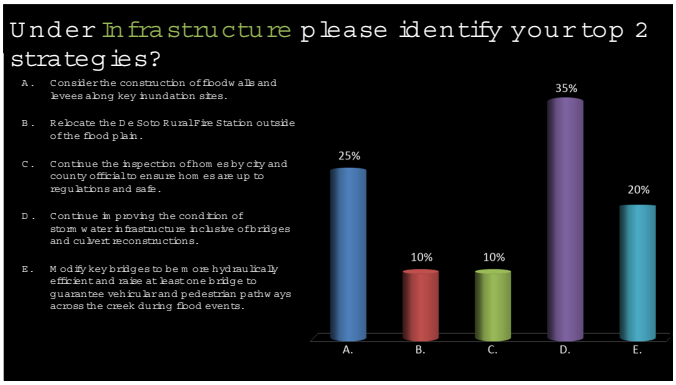
- Developing affordable housing in or adjacent to De Soto.
- Dry or wet flood proofing businesses and homes
- Build a levee to protect main street
- Expand parks & green space along the Joachim Creek.
- Expand warning system and flood risk communication tools.
- Continue updating the emergency preparedness plan.











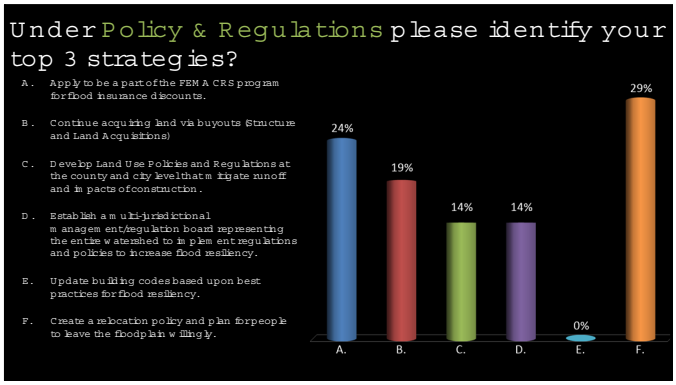


Fig 2.2.1Prioritization Results from Engagement Process

- Implement evacuation route signage.
- Develop community wide education, outreach, and advocacy programs for the public.
- Create and accessible public record of risks and hazards for properties, development, and community awareness.
- Improve water flow by clearing islands in the creek and accumulated debris/ sediment.
- Take the opportunity to develop wetland, stream, and riparian protection measures.
- Support basic and applied research to support an understanding of the particular conditions of the Joachim Creek.
- Look into vacant land that can be leased/ purchased/easement by the city for detention ponds, levees, and basins.
- Consider the construction of flood walls and levees along key inundation sites.
- Continue improving the condition of stormwater infrastructure inclusive of bridges and culvert reconstructions.
- Apply to be a part of the FEMA CRS program for flood insurance discounts.
- Continue acquiring land via buyouts (Structure and Land Acquisitions)
- Create a relocation policy and plan for people to leave the floodplain willingly.

City and Community Accomplishments

The review and filtering of the aforementioned strategies included considerations for current and future projected city work. It is important to note that De Soto is continuously:

- Buying key flood plain properties when affordable and the opportunity presents itself.
- Lining and repairing storm water infrastructure throughout the city.
- Improving the condition of open tributary channels.
- Actively enforcing storm water ordinances within city boundaries.
- Proactively designing new developments to hold back stormwater on their respective sites.
- Supporting the local non-profit groups and other local, state, and federal organizations with pipeline projects, studies, and applicable grants.
- Working to increase and improve the accuracy of the warning systems and response teams.
- Actively using the stream gauge to monitor conditions, alert the public, and predict future/incoming events.

2023 Flood Resiliency Plan

The 2023 Flood Hazard Mitigation Plan is built on the foundation and calibration of past planning efforts and studies. While the other planning studies presented limited and specific scopes of work and effort the 2023 plan assess flood mitigation and resiliency at a city wide and watershed wide level for a holistic approach.

What's New in the Flood Resiliency Planning Process?

A Holistic Approach to Planning

The 2023 Flood Hazard Mitigation Plan follows a holistic planning approach that accounts for both economic and social resiliency. It takes into account diverse sources of funding, economic development, and community development and growth as key premises to a resilient community. Previous plans and studies only focused on limited scopes rather than a city wide analysis and approach like the 2023 plan.

Update and Tracking Metrics

Chapter 9 of the plan incorporates metrics and instruction for the update and future incorporation of the plan to ensure it remains relevant to the City and the real-time conditions of flooding as events are expected increase in frequency and intensity and have been in the last decade. A few of the key recommendations include:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization
- Actively involve and engage the public to educate and assess public opinion of the plan success.

New Analysis Information (Chapters 2 & 5)

In addition to past studies and reports formed around the Joachim Creek and De Soto and referenced in this plan the 2023 Flood Hazard Mitigation Plan also includes analysis of:

- ***De Soto Regional Context***
- ***De Soto City Profile***
- ***De Soto Natural Resources + Features***
- ***De Soto Built Feature Characteristics***
- ***De Soto Economic Overview***
- ***Risk + Vulnerabilities Assessment***

Priority and Timeline (Chapter 7)

The plan includes recommended action items and categorizes them into time frames to develop a road map for implementation for the city of De Soto. (Chapter 7)

Funding and Financial Mechanisms (Appendix I)

The plan includes a list of grants and funding resources applicable to De Soto that they can explore and pursue in an effort to implement mitigation projects and perform buy outs in the City.

Voluntary Buyout Program Framework Plan (Appendix E)

Although integrated as an essential element of the planning process the plan includes and independent report for the buyout plan framework which lays the roadwork for De Soto to pursue a city supported buyout and voluntary property acquisition program.

Housing and Relocation Framework Plan (Appendix F)

To support the buyout program is an independent report of housing laying out how the city can approach relocation assistance and support diverse and affordable housing developments for residents as buyouts begin.

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2.3

PLANNING PROCESS

Introduction

This De Soto Flood Mitigation and Resiliency Plan was developed under the guidance of the De Soto City Manager and City Council, who helped determine the most successful methods of engagement for their community and identified key residents and stakeholders to engage throughout the process. A local resident formed non-profit organization, The Citizens Committee for Flood Relief, was also heavily involved in engaging flood victims, state leadership, and distributing communications for meetings and events during the planning process.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local policy in the future to help reduce the cost of disaster response and recovery and prioritize the lives of community members at risk of flooding by working to protect community assets, expand resources, improve overall community awareness and education, and develop projects to reduce the frequency and risk of future flooding events in De Soto.

To appropriately understand the risk and challenges of flooding events in De Soto as well as the overall capacity to respond in dangerous flooding situations, the plan took a proactive approach to engagement involving local, state, and community stakeholders from the onset of the project to ensure that the needs of the community and city were met and to ensure that beyond the level of the city support came from the respective regional governments and organizations. Additionally, the formation of the project team was done with a multi-disciplinary mindset bringing together a planning firm, an economist, buyout and resiliency planning specialists, and hydrologists to cover and involve the community in all phases of the planning effort from the identification of risks to the potential solutions and implementation. The plan recognizes that any effective strategy to mitigation and resiliency spans from a plan a community can take ownership for and participate in developing and implementing.

The Planning Process Structure

The De Soto Resiliency Planning Process was developed as a three phased year long approach from June 2022 culminating in June 2023. Each phase of the project consisted of a series of deliverables, community engagement meetings, and local/county leadership meetings that provided the necessary feedback and edits to develop iterations of strategies throughout the process and continuously vet them with residents, city officials, county officials and within the expert planning consultant team.

Leadership and Involved Stakeholders

The De Soto Resiliency Planning Process was spearheaded by the De Soto City Manager Todd Melkus who acted as the primary point of contact for the project and mitigation grant funding it. Throughout the process the team met with an implementation working group which was assembled by Todd Melkus to review the plan at its various stages and provide their professional feedback and expertise in its development. The working group was designated to be multi-disciplinary and multi-jurisdictional including residents, city leadership, and county leadership given the implications of the overall watershed on the city which lies primarily in Jefferson County The implementation working group was composed of the following 9 members:

1. ***Todd Melkus:***
   De Soto City Manager and Floodplain Administrator
2. ***Warren Robinson:***
   Jefferson County Emergency Management Director
3. ***Rosie Buchanan:***
   Director of the Economic Development Corporation of Jefferson County
4. ***Eric Larson:***
   Former Director of Jefferson County Services and Code Enforcement
5. ***Thomas Fitzgerald:***
   De Soto Rural Fire Department Chief
6. ***John Scullin***
   De Soto Rural Fire Department Deputy Chief
7. ***Karen McHugh***
   Missouri State Emergency Management Director
8. ***Edward Boyer***
   Local Resident, Contractor, Engineer and Developer
9. ***Susan Liley***
   Resident and Co-Founder of the Citizens Committee for Flood Relief

The multi-disciplinary and multi-jurisdictional time met three (3) times throughout the process one per each of the three project phases as follows:

Meeting Type	Meeting Date	Meeting Location
Implementation Working Group Meeting 1	February 28th, 2023 1:30PM-3:30 PM	ZOOM
Implementation Working Group Meeting 2	April 25th, 2023; 11AM - 1PM	ZOOM
Implementation Working Group Meeting 3	May 22nd 2023, 11AM - 1PM	ZOOM

Fig 2.3.1 Implementation Working Group Meeting Table

Each of the meetings consisted of a presentation relaying the pertinent data and information of the planning process and each meeting consisted of an interactive worksheet/work product which as a supplement to meeting discussions would be a record of comments, feedbacks, suggestions, and ideas of working group members throughout the development of the plan (See Appendix G).

In addition to the working group the project team conducted stakeholder interviews with key identified community leaders, residents, business owners, city staff, emergency staff, and county leaders. An important of planning for resiliency is for the team to understand not only the way in which residents living in the floodplain are impacted, but also the way in which business, city, and county operations are impacted when flooding events occur. The following is the list of stakeholders recommended by Todd Melkus to be interviewed:

1. ***Kathy Smith:***
   De Soto City Mayor
2. ***Kevin Warden:***
   De Soto Public Works Director
3. ***Rich McCane***
   De Soto Councilperson
4. ***Warren Robinson:***
   Jefferson County Emergency Management Director
5. ***Rosie Buchanan:***
   Director of the Economic Development Corporation of Jefferson County
6. ***Eric Larson:***
   Former Director of Jefferson County Services and Code Enforcement
7. ***Thomas Fitzgerald:***
   De Soto Rural Fire Department Chief
8. ***Karen McHugh***
   Missouri State Emergency Management Director
9. ***Edward Boyer***
   Local Resident, Contractor, Engineer and Developer
10. ***Dr. Josh Isaacson***
    De Soto Schools Superintendent
11. ***Justin Caldwell***
    Flood Impacted Business Owner

In addition to the contact list of stakeholders provided by Todd Melkus the planning team pursued interviews with additional residents, state departments, and federal departments which have been involved with previous flood work and development studies in the Joachim Creek and Upper Joachim Creek Watershed. The additional stakeholders included:

1. ***Paula Arbuthnot***
   Engineer and Co-Founder of The Citizens Committee for Flood Relief
2. ***Paul Rydlund:***
   Section Chief for Surface Water and Modeling USGS Central Midwest Water Science Center
3. ***Robb Jacobson:***
   Research Hydrologist
4. ***Matthew Jones***
   US Army Corps of Engineers and CAT program lead for St. Louis District
5. ***Billy Hackett***
   MO Department of Natural Resources 401 Water Quality Coordinator

The stakeholder interviews were all conducted via Zoom and consisted of an hour long interview with supporting maps of the City of De Soto and Watershed with emphasis on the flood impacted areas. During the interviews respondents were asked questions related to their topics of expertise. Many of the interviewed stakeholders have either worked or lived in the city or county for a long time or have specifically been involved in flood resiliency and engineering work in De Soto in the last decade. Full transcripts of the interviews and responses can be found in *Appendix G.*

The final critical leadership group involved in the process was the De Soto City Council composed of four members:

1. ***Kathy Smith:***
   De Soto City Mayor
2. ***Autumn Blanchard:***
   De Soto Councilperson and Chairwoman Pro-Tem
3. ***Jim Akers:***
   De Soto Councilperson
4. ***Rich McCane***
   De Soto Councilperson

The City Council was welcomed to attend all public and community meetings. Throughout the planning process they were engaged as key stakeholders, received a briefing of the draft plan, and received a copy to review of the final resiliency plan for final comments and recommendations prior to final submission.

Community Engagement

The residents of De Soto were presented with many opportunities to comment in and participate in the development of the plan throughout the process. The planning process hosted 2 large community meetings, two rounds of neighborhood scale and one-on-one flood impacted resident meetings, ongoing web engagement through both a planning process website and community priorities survey and educational materials in the form of printed information and documents. The following chart outlines all of the public and community meetings and events hosted throughout this project:

Meeting Type	Meeting Date	Meeting Location	Attendance
Stakeholder Interviews	December , 2022	ZOOM	18 Interviews
Website Survey + Engagement	Ongoing	https://buy-in.org/resilientdesoto	N/A
Public Meeting #1	March 7th 2023	De Soto City Hall	11 people
Governor Nixon Site Visit	March 24th, 2023	City of De Soto	N/A
On Site Neighborhood Meetings #1	March 24th, 25th 2023	Pogolinos Pizza, Just Be Kind Coffee Shop, De Soto Library	25 people
On Site One on One Meetings #1	March 24th, 25th 2023	Resident Homes	5 residents
SLU Water Summit Panel	May 2nd, 2023	Saint Louis University	Audience of 40+
City Council Briefing	May 11th, 2023	De Soto City Hall	4 members
On Site Neighborhood Meetings #2	May 16th, 17th 2023	Just Be Kind Coffee Shop	20 people
On Site One on One Meetings #2	May 16th, 17th 2023	Resident Homes	5 residents
Public Meeting #2	May 16th 2023	De Soto Community Center	35 people
Final Plan Review Period	Week of May 22nd 2023	Posted to City and Plan Website	N/A

Fig 2.3.2 Meeting Schedule

To engage community members and spread the word about the plan, community events, and further engagement the following public outreach efforts were employed throughout the process:

Effort	Description
City Website	A tab was developed on the city website to distribute information.
City Announcements	Meeting announcements were posted on the red board and city websites.
Plan Website	A planning process website was developed where all public presentation documents and event images were posted aling with meeting work products and a survey.
Priorities Survey	A survey of the planning priorities was developed and made accessible so that residents could vote towards their planning priorities and inform of us of community needs.
Education & Outreach	Print materials were developed (flyers, packets, plans) of planning process and buyout plan FAQ's, process and timeline, engagement resources, and interest forms to educate the community.
Social Media	Announcements were put out on the City Facebook, Citizens Committee for Flood Relied Facebook, Chamber of Commerce Facebook, etc. for public and community meetings.
Newspaper	Articles were written in The Leader (Local Newspaper) to advertise the public meeting and the planning process.
Radio	The team interviewed with a local radio station to air the public meeting and planning process information.
Posters/Flyers	Poster and flyers were distributed in area businesses and residential mailboxes.

Fig 2.3.3 Engagement Efforts Table

Planning Timeline and Deliverables

The year long planning process, developed in three phases, had a requirement for key technical and engagement tasks to meet the established goals of the resiliency plan and process. It is outlined as follows:

Phase 1: Flood Vulnerability Risk Assessment

Technical Tasks

Phase 1 of the resiliency planning project primarily consisted of the development of three baseline documents produced through on site surveys, stakeholder interviews, research, plan reviews and city internal reviews as a comprehensive effort to identify, document, and profile all flood hazards that have, or could have an impact on the City of De Soto including a projection of climate change and future precipitation patterns. This data and the documents developed as a part of them were formulated using available GIS data and the review of three previous studies completed for De Soto by the USGS and US Army Corps of Engineers. The documents were assembled and distributed internally for review from the city and planning team before being made publicly available in the project website to the public. Once reviewed and assembled the documents formulated the risk assessment presented in chapter 5.The three baseline analysis reports and documentation were as follows:

1. ***The City Wide Assessment (See Appendix B):***

   This document consisted of an existing conditions and demographic analysis of The City of De Soto. It served as a reference resource and as a community profile throughout the planning process to be consistently referenced in the development of strategies and community engagement. The document consisted of 8 sections:

   1. *Executive summary*
   2. *Existing plan review*
   3. *Regional context analysis*
   4. *City profile*
   5. *Natural resources and features*
   6. *Built feature characteristics*
   7. *City economic overview*
   8. *Summary of key conclusions*

   Since the planning process sought to provide a holistic approach to resiliency planning inclusive of flood resiliency, social resiliency, and economic resiliency, this document was produced as the baseline understanding to assess the issues, opportunities, and gap areas of the city of De Soto as a whole. Once reviewed by the city and planning team the document was made readily available to the public on the project website and presented in summary format at the public meetings and to the implementation working group.

2. ***The Vulnerabilities Assessment (See Appendix C):***

   This document consisted of a parcel level assessment of flood impacted properties to assess the risk exposure to physical infrastructure, community infrastructure, and people. It consists of six sections:

   1. *Executive Summary*
   2. *Exposure Analysis*
   3. *Physical Vulnerabilities*
   4. *Non-Physical Vulnerabilities*

5. *Social Vulnerabilities*
6. *Natural Environment Vulnerabilities*

A key effort of the resiliency planning effort was to understand who and what in De Soto is at risk of flooding. The vulnerability reports was the baseline document keeping a record of the overall impacts of flooding in the city and flooding's disruption to daily life and operations. The gage analysis included within and the identified overlap of risks informed the priority areas with enhanced vulnerability and therefore key mitigation areas and action items of the resiliency plan. Once complete this document was distributed to the planning team and city for review and presented in community meetings and to the implementation working group in a summary format.

3. The Socio-Economic and Market Analysis (See Appendix D):

This document consisted of demographic and social profiles, economic disruptor, and market potential comparisons between the county, city, and state. It served to identify De Soto's capacity in comparison to its peer city and to identify market and economic potentials where De Soto could improve in order to provide a strong tax base and revenue for future mitigation projects, disaster relief, and community growth/development. It also analyzed the housing market in De Soto to identify the opportunities available to the community and city in terms of relocation and affordable housing options for flood impacted residents. This analysis document was integrated into the community wide assessment for public access but stands as and individual data and planning document.

Together these three documents composed the overall Community Risk Assessment presented in Chapter 5 of the Flood Resiliency Plan. All data and analysis was taken out to the community to some degree in the public meeting presentations.

Key Engagement

Phase 1 engagement focused on presenting the public and implementation working group with the data and analysis collected, reviewing the US Army Corps of Engineers and USGS plans with them, and beginning to identify community priorities for the plan. The following chart describes the activities and topics of each of the key engagement meetings hosted in phase 1:

See Appendix G for all meeting reports, presentations, and work products.

Phase 1 Engagement Overview			
Meeting Type	**Meeting Topics**	**Date**	**Location**
Implementation Work Group Meeting 1	- Review of Existing USGS and USACE strategies from previous plans - Review of Community Risk Assessment Summaries	February 28th, 2023 1:30PM-3:30 PM	ZOOM
Public Meeting 1	- Review of Existing USGS and USACE strategies from previous plans - Review of Community Risk Assessment Summaries - Polling exercise for meeting demographics - Pre-liminary prioritization exercise on existing plan strategies	March 7th 2023 6:30PM - 8PM	De Soto City Hall

Fig 2.3.4 Phase 1 Engagement Overview Table

Phase 2: Draft Flood Resiliency Plan

Technical Tasks

Phase 2 of the resiliency planning project consisted of the development of the draft resiliency frameworks for the mitigation plan and had a core set of engagement activities for the public to provide input. In this phase the team established the goals, objectives, and action items of the plan based on the data collected to date, conversations with stakeholders, and the results of the phase 1 engagement meeting priorities. The goals, objectives, and action items integrate components of the buyout framework plan, housing and relocation framework plan, and economic framework plan into the action items and verbiage developed for the plan. The full list of goals, objectives and action items can be found in the Mitigation Strategy and Action Plan Section of the Resiliency Plan in Chapter 7 or Appendix H.

Key Engagement

Phase 2 engagement focused on presenting the public and implementation working group with the draft plan which consisted of the draft goals, objectives, and action items. During this time the team presented the work to the implementation group to gather feedback and comments for the final plan iteration and with the facilitation of Buy In Community Planning took these recommendations, once vetted by the working group, out to the community in a series of small scale geographically targeted neighborhood meetings. The following chart describes the activities and topics of each of the key engagement meetings hosted in phase 2:

Phase 2 Engagement Overview

Meeting Type	Meeting Topics	Date	Location
Governor Nixon Site Visit	- Tour of afflicted areas, neighborhoods, and resident chats - Discussion of dams and potential legal and financial assistance to De	March 24th 2023 10AM - 12PM	City of De Soto
Neighborhood Meetings #1	- Buyout Plan information and FAQ's - Planning prioritization workshops - Goal, objective, action item development and review	March 25th -26th 2023	Pogolino's Pizza, Just Be Kind Coffee Shop, De Soto Library
One on One Meetings #1	- Resident interviews (health, preparedness, buyouts) - Assessment of resident needs and buyout application check ins	March 25th - 26th 2023	Resident Households
Implementation Work Group Meeting 2	- Review of engagement to date and community feedback - Review of the draft resiliency plan goals, objectives, action items	April 27th, 2023 11AM-12:30 PM	ZOOM
SLU Water Summit Panel	- Educational panel on De Soto and the impacts of flooding - Planning process & methodology overview - Q&A geared towards idea development from professionals -Networking opportunity for planning process	May 2nd 2023	Saint Louis University

Fig 2.3.5 Phase 2 Engagement Overview Table

See Appendix G for all meeting reports, presentations, and work products.

Phase 3: Final Flood Resiliency Plan

Technical Tasks

Phase 3 of the resiliency planning project consisted of the development of the final resiliency framework elements for the mitigation plan and had a core set of engagement activities for the public to provide input. In this phase the team established the final revised version of goals, objectives, and action items of the plan based on input from the engagement activities completed in Phase 2. The goals, objectives, and action items integrate components of the final buyout framework plan (Appendix E), housing and relocation framework plan (Appendix F), and economic framework plan (Appendix D) into the action items and verbiage developed for the plan. The full list of goals, objectives and action items can be found in the Mitigation Strategy and Action Plan Section of the Resiliency Plan in Chapter 7 or Appendix H.

Key Engagement

The final phase of engagement was set up for final review by the public, implementation working group, city council, and planning team. This final round of feedback was developed to assess the final action items, priorities, and timeline of the plan to ensure that it was consistent with the capacity of the city and goals and vision of the city council for the resiliency plan. The following chart describes the activities and topics of each of the key engagement meetings hosted in phase 3:

Phase 3 Engagement Overview			
Meeting Type	**Meeting Topics**	**Date**	**Location**
City Council Briefing	- Summary of final goals, objectives, and action items	May 11th 2023 5:30PM - 7:00PM	De Soto City Hall
Public Meeting 2	- Summary of Final plan goals, objectives, and action items - Action item facilitated workshops - Community priority identification - Buyout application and plan chats	March 16th 2023 6:30PM - 8PM	De Soto Community Center
Neighborhood Meetings #2	- Buyout program conversations with community members - Housing needs assessment and rehousing options for flood impacted neighborhoods	May 16th -17th 2023	Just Be Kind Coffee Shop
One on One Meetings #2	- Buyout program conversations with community members - Housing needs assessment and rehousing options for flood impacted neighborhoods - Flood Impacted Resident interviews	May 16th-17th 2023	Resident Households
Implementation Work Group Meeting 3	- Summary of final goals, objectives, and action items - Planning priority exercise and timeline - Plan organization review -Buyoutplan and Housing Framework Plan review	May 22nd 2023 1:30PM-3:30 PM	ZOOM
Final Public Comment & Review	- Posted review of plan document for community and city review	Week of May 22nd	Online

Fig 2.3.6 Phase 3 Engagement Overview Table

See Appendix G for all meeting reports, presentations, and work products.

Coordinating Efforts

For the success of the plan it is critical for the City of De Soto to form partnerships if they plan to address the issues at hand. This is because not only is the majority of the watershed that affects the city in county land but also because to implement physical and mitigation strategies in De Soto requires permits and permissions from the MO Department of Natural Resources and US Army Corps of Engineers. A critical component of engagement and planning was maintaining relevant organization involved as evidenced by the working group composed of county officials.

Additional coordination and unique opportunities for this planning process involved working with the Citizens Committee for Flood Relief, Anthropocene Alliance, and Department of Natural Resources to sponsor a grant application for the community. A Department of Natural resources team attended the second public meeting and has remained open communication with the City and non-profit groups. The team hosted former Missouri Governor Jay Nixon to give him a tour of the issues at hand and assess the ways in which he could assist the planning and mitigation effort. The plan openly supports the future efforts of the USGS modeling team and Corps of Engineers who are working to securing funding for additional precipitation based modeling and infrastructure projects. The planning process involves Buy-In Community Planning who has been working with residents since 2020 to secure buyout funds and applications. The plan uses the previous studies and several regional studies as a foundation for work on goals, objectives, and action items throughout the planning process including but not limited to:

- ***The St. Louis Regional Hazard Mitigation Plan (2020-2025)***
- ***The De Soto Emergency Action and Evacuation Plan (2021)***
- ***Upper Joachim Creek Floodplain Management Plan (2019)***
- ***USGS 2D Hydraulic Analyses of Joachim Creek (2021)***
- ***Jefferson County Master Plan (2003, currently being updated)***
- ***Jefferson County Roadway Master Plan (2021)***
- ***Route 21 Corridor Plan by MODOT***
- ***Jefferson County Road Safety Plan (2019)***
- ***APA Historic Downtown: Nature Based + Green Infrastructure Flood Resiliency Framework Plan (2021)***
- ***2020 Buy In Community Planning Buy-Out and Resident Surveys***

These planning efforts completed by county, local, and national firms and organizations were deemed appropriate documents to influence the development of the planning process and action items. They influenced the development of the risk assessment by indicating the growth, desires, objectives, and developments of key entities and the community. These plans are included as part of the community city assessment document in appendix B.

Planning Process Overview

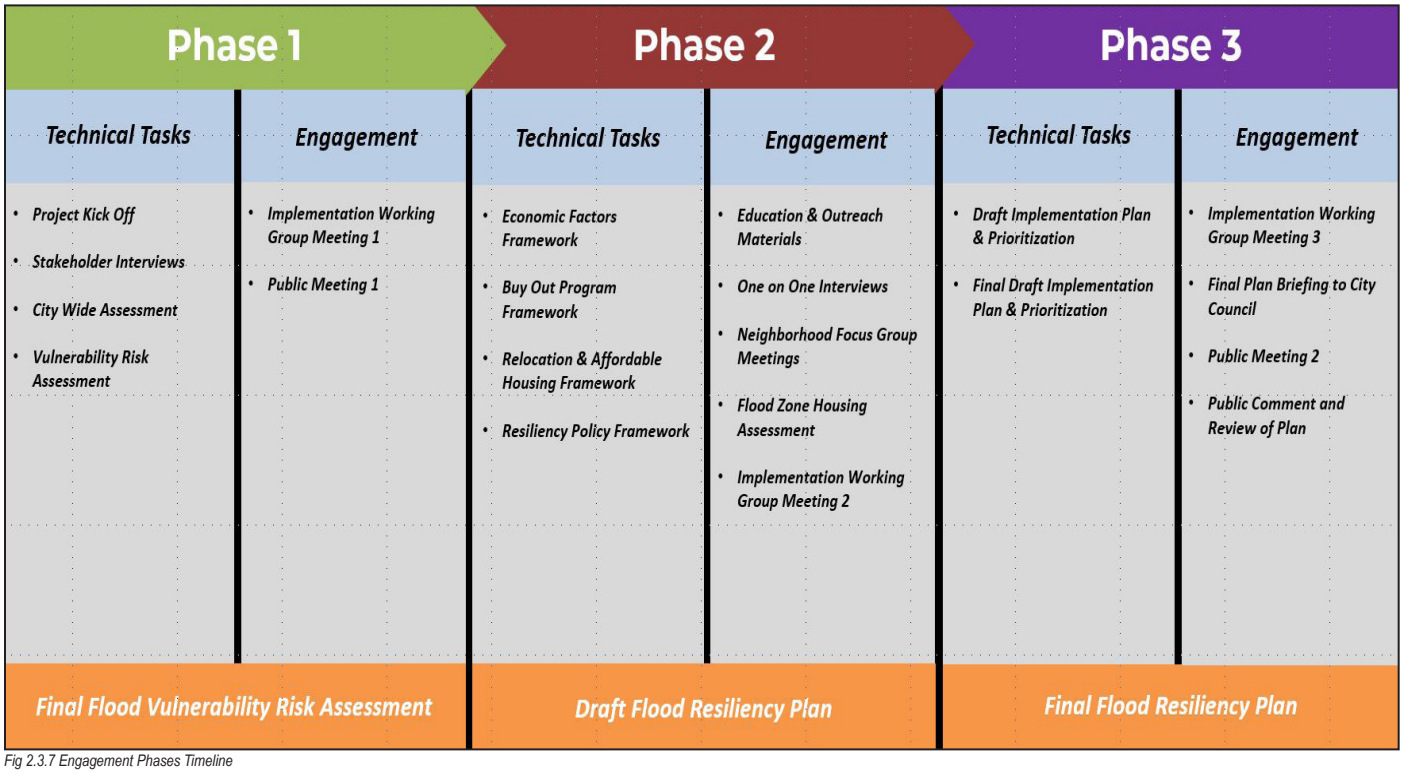


Fig 2.3.7 Engagement Phases Timeline

2.4

RISK ASSESSMENT

Introduction

This section describes the risk assessment for the City of De Soto Flood Resiliency Plan. As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

The Flood risk assessment covers the areas in the City of De Soto that are affected by the flooding of the Joachim Creek which is typically a flash flooding event. The primary areas of study are along the creek corridor between the Joachim Creek and Union Pacific Railroad, adjacent to Walther Park, Main Street De Soto, and properties adjacent to The Tanyard Branch tributary stream and County Tributary Stream. These focus areas were selected based on the FEMA Flood Maps of the City of De Soto, site observation of damaged conditions, and resident and City testimony of flood impacted areas through interviews and other forms of engagement.

Identifying Hazards

Based on past studies and available data De Soto is primarily prone to flood specific hazards. The following table represents a summary of the main flood specific hazards that put the community of De Soto at risk:

Hazard	Possibility of Occurrence	Occurred in the last decade?
Dam/Levee Failure	Unlikely, but cautioned	No
Stormwater Backups	Likely	Yes
Flood: 100/500 year	Highly Likely	Yes, 2013, 2015, 2016, 2018, 2020, 2021, 2022
Creek Bank Erosion	Likely	Yes

Note: While a dam or levee failure hasn't occured yet, De Soto has 15 unregulated dams upstream which are classified as hazardous including one class hazard 2 dam. Dam and levee failure should be considered a critical hazard to the City.

Fig 2.4.1 Relevant Flood Hazards Table

Past Flooding Events

In the last decade, the City of De Soto has reached flood action stage, which is designated at 8' gage height, 12 times. The chart on the facing page represents the available data regarding the occurred flood events in the last decade in De Soto. Note that detailed event data was not available until 2018 with the installation of the USGS stream gage to monitor event conditions.

Major Flooding Events in De Soto since 2013								
Events:	Rainfall	Action Stage 8'	Peak	<8'	Discharge	Event Duration	Time from activation to peak height	Comments
Before installation of Stream Gage								
April 13th, 2013	N/A	N/A	14.30'	N/A	N/A	N/A	N/A	
June of 2015	7.95"	N/A	N/A	N/A	N/A	N/A	N/A	
December of 2015	6.32"	N/A	N/A	N/A	N/A	N/A	N/A	
May of 2016	5.32"	N/A	N/A	N/A	N/A	N/A	N/A	
August of 2016	6.32"	N/A	N/A	N/A	N/A	N/A	N/A	
April of 2017	6.86"	N/A	N/A	N/A	N/A	N/A	N/A	
After installation of Stream Gage								
September 8th, 2018	.92"	5:55AM	8.20' (6:15AM)	6:45AM	8.17 ft3/sec	55 minutes	20 minutes	Tropical Storm Gordon remnants moving across the United States
January 11th, 2020	3-4"	1:10AM	9.61' (1:55AM)	3:10 AM	9230 ft3/sec	2 hours	45 minutes	Unseasonably strong storm
April 29th, 2021	1.65"	3:55am	9.28' (4:35AM)	5:45AM	8620 ft3/sec	1hr 50min	40 minutes	
March 30th, 2022	2.47"	3:25PM	8.68' (4:35PM)	5:55PM	6900 ft3/sec	2hrs 30min	1 hr 5 minutes	
July 29th, 2022	2.29"	3:35PM	9.93' (4:15PM)	5PM	10,100 ft3/sec	1hr 25min	40 minutes	

Note:
Data was acquired through USGS Gage Viewer, and NOAA historic crests records. The Joachim Creek Stream Gage was not installed in De Soto until 2018. There are no records for the height, time, duration, and discharge of events before installation in 2018. Data is limited to a 5 year period.

Fig. 2.4.2 Past Flood Events

According to the available stream gage data for De Soto the recorded events only lasted an average of 1hr and 45 minute from the moment the water levels reached 8' until then were under 8'. Given the flash flooding conditions of The Joachim Creek in De Soto residents would have only had on average 30 minutes to evacuate and get out of the flood risk areas from the moment the alert is sounded at 8' until the time these recorded events reached their peak conditions.

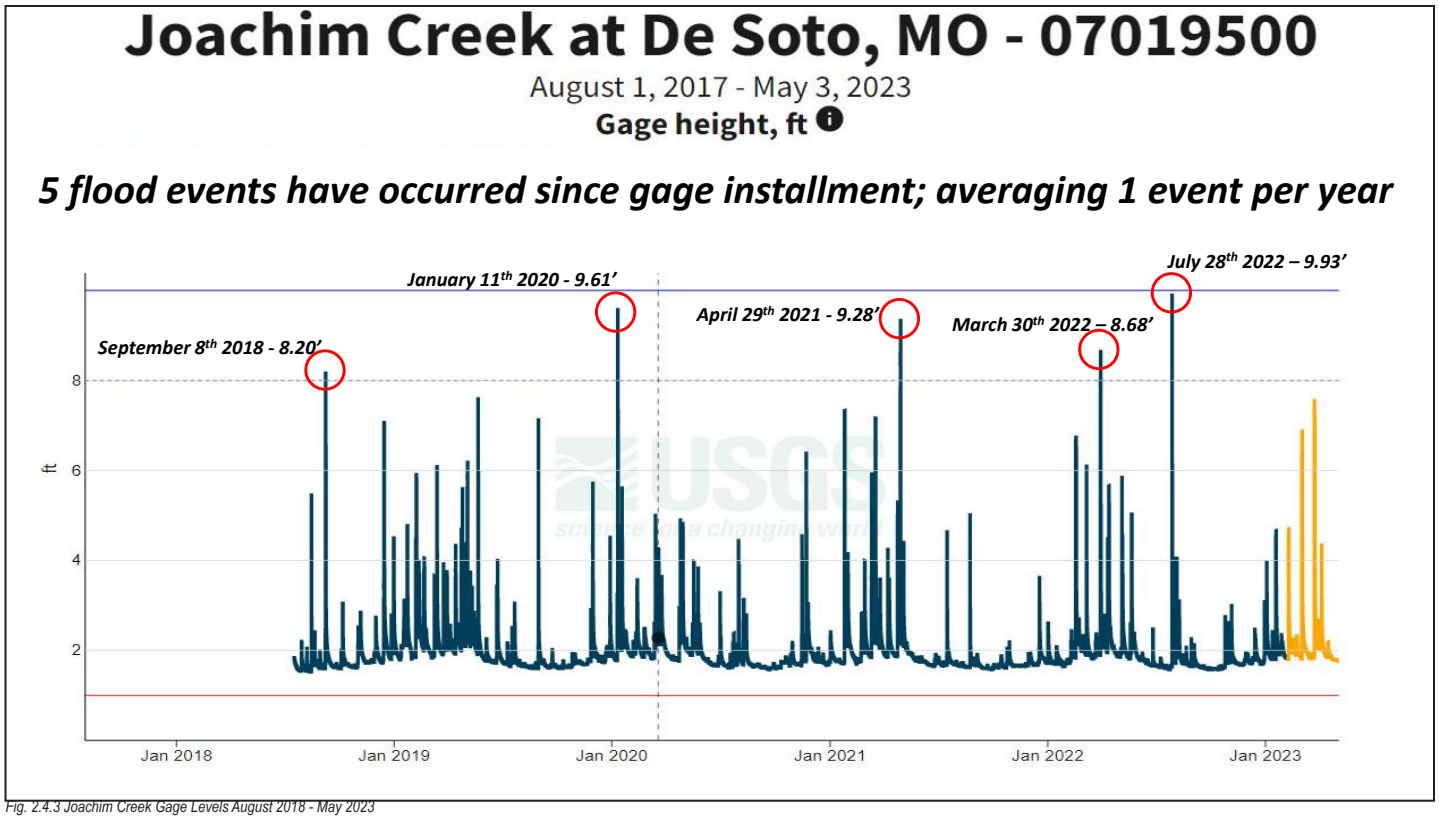


Fig. 2.4.3 Joachim Creek Gage Levels August 2018 - May 2023

Effects of Climate Change

Flash flooding events are expected to increase in both frequency and intensity in the De Soto region over the next several years. The NOAA National Center for Environmental Information's Missouri State Climate Summary 2022 indicates that "Missouri has experienced an increase in extreme precipitation events, a trend predicted to continue, further increasing flooding along rivers and streams." According to the chart below Springtime Precipitation in Jefferson County, MO is expected to increase between 10 - 15%. Spring and Summer are historically the most flood prone months to De Soto.

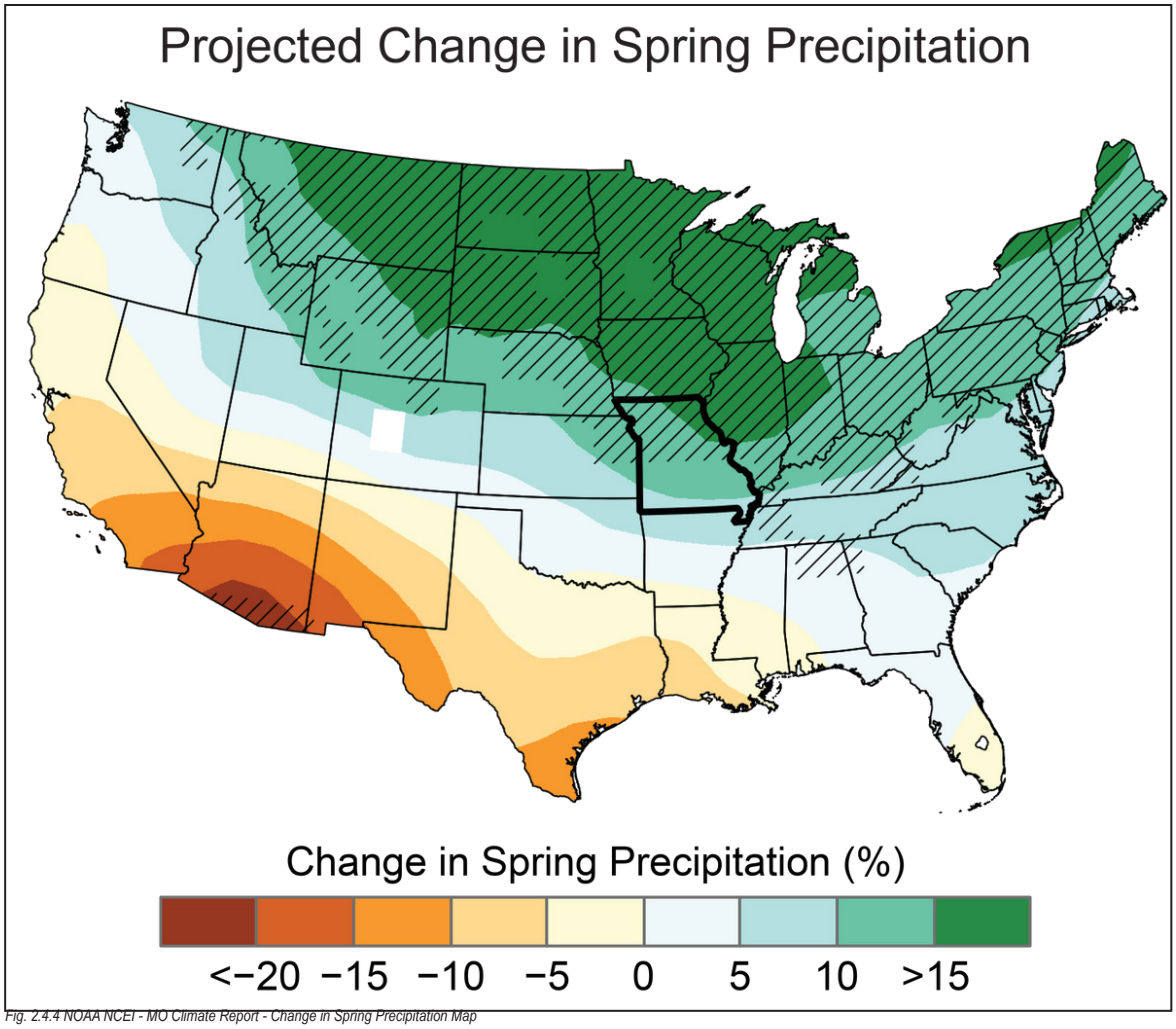


Fig. 2.4.4 NOAA NCEI - MO Climate Report - Change in Spring Precipitation Map

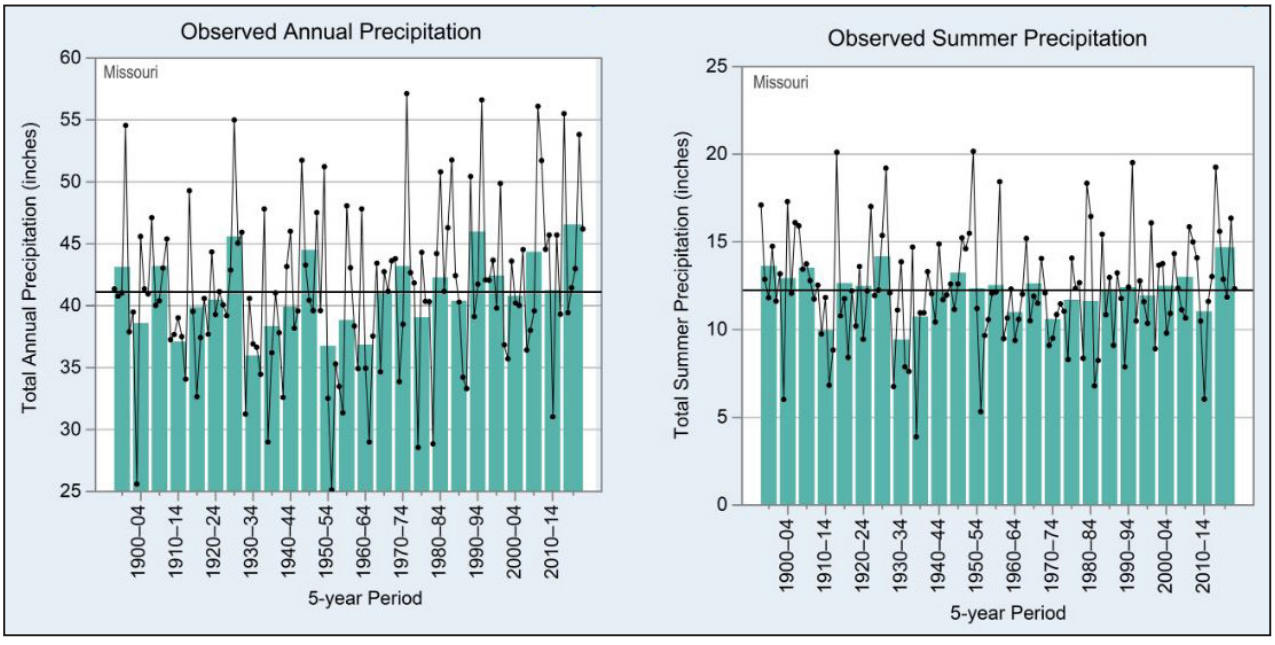


Fig. 2.4.5 NOAA NCEI - MO Climate Report - Change in Annual and Summer Precipitation

Risk Assessment Methodology

Each of De Soto's flood hazards will be evaluated independently throughout this risk assessment. First, each will be assigned a prioritization value based on the following priority risk index table carried over from the Savannah Mitigation Planning Process. The method utilizes 5 weighted assessment categories to prioritize the hazards as shown below:

RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OF RISK CRITERIA	INDEX	WEIGHT
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	4	
IMPACT In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 DAY	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES > 30 DAYS.	4	
SPATIAL EXTENT How large of an area could be impacted by a hazard event? Are impacts localized or regional?	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4	
WARNING TIME Is there usually some lead time associated with the hazard event? Have warning measures been implemented?	**MORE THAN 24 HRS**	SELF DEFINED	1	10%
	12 TO 24 HRS	SELF DEFINED	2	
	6 TO 12 HRS	SELF DEFINED	3	
	LESS THAN 6 HRS	SELF DEFINED	4	
DURATION How long does the hazard event usually last?	**LESS THAN 6 HRS**	SELF DEFINED	1	10%
	LESS THAN 24 HRS	SELF DEFINED	2	
	LESS THAN 1 WEEK	SELF DEFINED	3	
	MORE THAN 1 WEEK	SELF DEFINED	4	

Fig. 2.4.6 Savannah Mitigation Plan Hazard Prioritization Matrix

The sum of all five risk assessment categories equals the final PRI value, demonstrated in the equation below (the lowest possible PRI value is a 1.0 and the highest possible PRI value is 4.0).

Since De Soto is a limited capacity community it is important for them to consider putting their resources to the areas that will most impact the city in the future. The Priority Risk Index Score assessed for each of the four major flood hazards the city faces assists in identifying what hazard will most impact De Soto and where resources and governmental capacity should be allocated for their flood resiliency planning efforts.

After determining the PRI score for De Soto's hazards the team broke the hazards down to identify areas of vulnerability and risk associated to each. Each hazard will be organized and described in the following way:

- Hazard Overview - general description of what the hazard entails.
- Areas at Risk - Specific locations in De Soto susceptible to and/or affected by the specified hazard.
- Infrastructure at Risk - An overview of critical structures and facilities affected by the identified hazard.
- Economy at Risk - An overview of the economic implications of this hazard on the City.
- Overall Vulnerability - An assessment of the overall vulnerability of the identified city locations specific to the identified risks.

The end of the prioritization section will demonstrate where city priorities should lie in terms of implementation given the valuation of stacked risks and overall vulnerability per location taking into account upcoming city projects and remediation efforts underway.

Asset Inventory

The following data represents the breakdown of affected properties in the floodplain areas of the City of De Soto. Data was acquired from both the available Jefferson County and De Soto GIS information as well as from the Jefferson County Assessor database.

Land Use in Affected Focus Areas	Parcels	Acreage	Value
South of Easton St. Sub Area			
Vacant/Agriculture/Parks	46 parcels	106 acres (48% of land)	$399,600.00
Residential	219 parcels	67 acres (31% of land)	$11,276,170.00
Commercial	68 parcels	38 acres (17% of land)	$11,112,800.00
Utilities and Services	7 parcels	5 acres (3% of land)	$177,100.00
Civic/Institutional	10 parcels	1 acre (1% of land)	$238,000.00
Totals	**350 parcels**	**217 acres**	**$23,203,670.00**
North of Easton St. Sub Area			
Vacant/Agriculture/Parks	19 parcels	80 acres (40% of land)	$189,500.00
Residential	12 parcels	4 acres (2% of land)	$888,700.00
Commercial	28 parcels	21 acres (11% of land)	$5,480,200.00
Utilities and Services	1 parcel	32 acres (16% of land)	$242,400.00
Industrial	5 parcels	47 acres (23% of land)	$245,400.00
Civic/Institutional	3 parcels	16 acres (8% of land)	$578,600.00
Totals	**68 parcels**	**200 acres**	**$7,624,800.00**

Note: Appraised value data is extracted from Jefferson County Assessor's Data. Some properties owned by the city and key institutions had no appraised value listed.

Fig. 2.4.7 Parcel Valuation of Affected Flood Area in De Soto

Regarding emergency management the following critical service, community facilities, and resource facilities are at risk and located within the floodplain. If impacted during a flood event critical care, services, and resources to the City of De Soto would become unavailable:

City Critical and Community Facilities	Number of Facilities	Number in Floodplain	Notes
Fire Stations	2 stations	1 station	Station elevated and floodproofed
Police Stations	1 Station	0 stations	
Ambulance Stations	1 Station	0 stations	
Electrical Substations	1 substation	1 substation	
Wastewater treatment facilitiy	1 station	1 station	
Railyard (out of De Soto in County)	1 station	1 station	Built levee around the train yard
Parks	10 parks	5 parks	
Community Center (Doubles as Shelter)	1 center	0 centers	
Parkview Baptist Church (Doubles as Shelter)	1 Center	0 centers	
De Soto Library	1 Library	1 Library	
De Soto City Hall	1 City Hall	0 City Halls	
Senior Care/Assisted Living	2 Facilities	0 Facilities	
Educational Facilities	7 facilities	1 facility	High School Football field and parking are in the floodplain
Total	30 facilities	11 facilities	Only one is an emergency facility

Fig. 2.4.8 Affected Critical, Community, and Resource Facilities

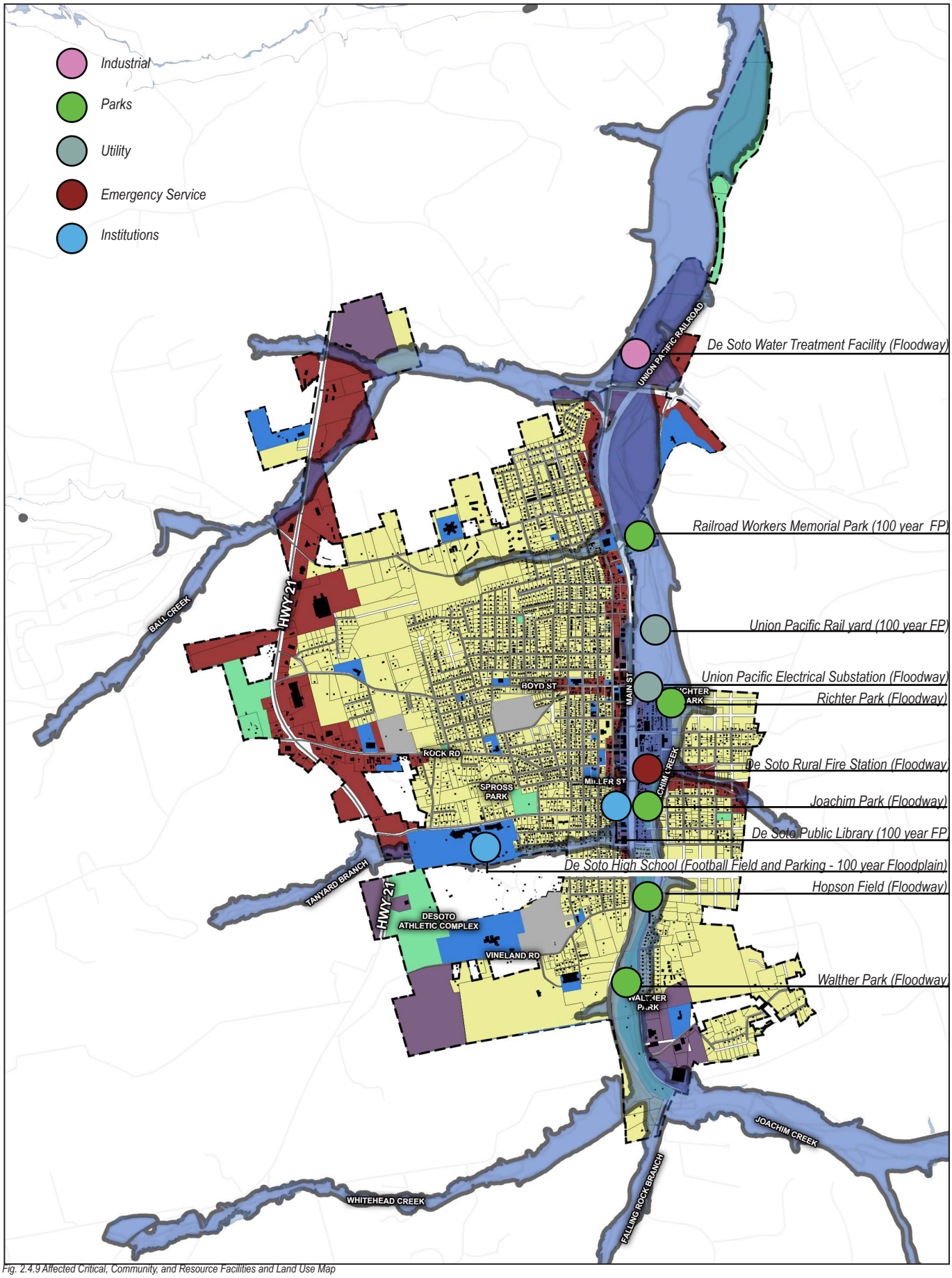


Fig. 2.4.9 Affected Critical, Community, and Resource Facilities and Land Use Map

Hazard and Vulnerability Analysis

The following table represents the summary priority index score for the four identified flood hazards faced by De Soto. Hazards were valued on a point scale where low priority hazards were valued between 1.0 and 2.0; moderate priority hazards were valued between 2.0 and 3.0; and high priority hazards were valued between 3.0 and 4.0. Based on the Priority Risk Index Rubric the highest priority hazards due to flooding in De Soto are the upstream dams and levees and the flash flood condition of the 100/500 year flood area. Other moderate to low hazards are stormwater backups and creek bank erosion.

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Dam/Levee Failure	Possible	Critical	Large	< 6 hours	< 1 week	3.0	HIGH
Flood: 100/500 year	Highly Likely	Limited	Moderate	< 6 hours	> 24 hours	3.0	HIGH
Stormwater backups	Likely	Minor	Small	< 6 hours	< 24 hours	2.2	MODERATE
Creek Bank Erosion	Likely	Minor	Small	> 24 hours	> 1 week	2.1	MODERATE

Fig. 2.4.10 De Soto Hazard PRI Scores Summary

People at Risk - All Hazard Areas

The De Soto Flood Plain areas which are the focus of this risk assessment are home to some of De Soto's most vulnerable residents and communities. When one overlaps the poverty index rate of the City and the Floodplain Maps there is an overlap between the most impoverished areas of the City and the flood plain affected regions. (See Fig. 5.11) This is because the flood conditions make housing more affordable in the flood plain due to the increased risk of the area. In general, housing values are lower, housing stock is older and out of date, and contract rents are extremely low making this high risk area very affordable to community members with little to no means to deal with and address flooding problems.

Additionally, 51% of housing in the flood plain areas is contract rental housing (see Fig. 5.12). Rental housing in the flood plain area is often the

recipient of high resident turn over. This turnover means that new people come into the high risk area with little to no knowledge of the flooding conditions and little to no preparation in terms of personal safety and preparedness plans if flooding were to occur.

Community survey results also indicate that a vast majority of the people living in the flood plain are older with an approximate average age of 60 and around 47% self-reporting as handicapped or disabled and 42% reporting someone else in the household as handicapped or disabled. Of the people living in the floodplain 53% of respondents felt that their homes were not safe places for the elderly or disabled, 89% reported having experienced some form of flooding, and 73% did not feel prepared to deal with major flooding events should they occur. Mentally, respondents interviewed also indicated feeling increased stress, anxiety, and emotional trauma due to flooding as over 65% indicated they expected their homes to flood and 33% expressed that flooding issues kept them up at night.

It is critical for the risk assessment to note that in the case of all four of De Soto's major flood hazard conditions the same vulnerable population is at risk of increasingly adverse effects. The affected floodplain population is generally at an increased risk because:

- They are generally unaware and uninformed of the flooding and condition and the steps to take during times of emergency.
- They have very little to no capital for flood proofing, elevations, or home repairs due to low incomes and are therefore less resilient when a flood strikes in terms of recovery.
- The increased age and health disparities in the floodplain community makes it challenging for residents to leave quickly and effectively evacuate in flash flood situations.

There is an overall increased risk to loss of life and property to flooding and its hazards in these areas of De Soto.

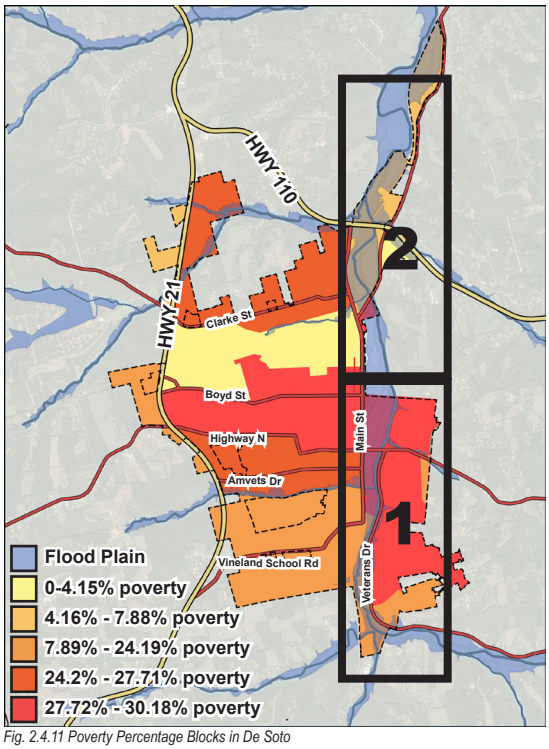


Fig. 2.4.11 Poverty Percentage Blocks in De Soto

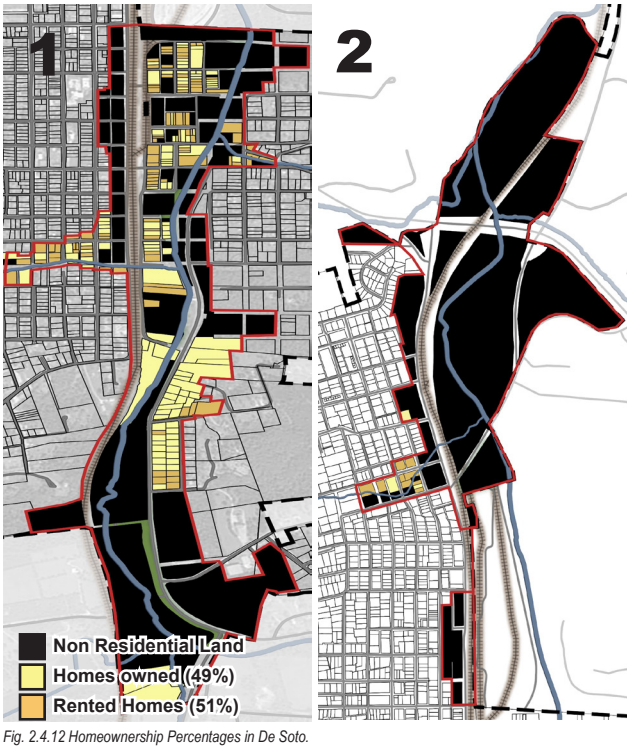


Fig. 2.4.12 Homeownership Percentages in De Soto.

Hazard: Dam/Levee Failure

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Dam/Levee Failure	Possible	Critical	Large	< 6 hours	< 1 week	3.0	HIGH

The concern of dam and levee failure is a high risk high priority condition in De Soto. The upstream watershed basin has a total of 19 high hazard dams. There are 15 dams upstream of De Soto all classified as high hazard dams, due to probable loss of human life if dam fails or is operated inappropriately. Valle Lake Dam is a state regulated dam, hazard class 2. Valle Lake is the largest lake that drains in the Joachim. This dam has limited flood storage function and is susceptible to over topping during heavy precipitation events.

Several dams have not been inspected in over 20-30 years. The table below is an inventory of dams outlined by the Corps of Engineers in their Watershed Management Plan (2019) the upstream dams are indicated with a red dot preceding their name.

Areas at Risk

The 15 upstream dams all flow through tributaries into the Joachim Creek which then flow into De Soto. Dam failure of any of these dams poses significant risk to watershed subdivisions and households adjacent to the creeks in the floodplain.
Further down into the City, all of De Soto's high risk flood able areas including Main Street would be at risk of expanded damage from flooding.

The map of the right demonstrates the location of the high hazard area dams and maps the flow of the potentially affected tributaries as they make their way into De Soto.

Dam Name	NID ID (MO)	River	Year Completed	State Regulated	Owner Name
Clear Lake Dam	30437	TR to Joachim Creek	1961	No	Sunrise Lakes Association
Dierberg Lake Dam	30441	TR to McMullen Branch	1968	No	WM C DIERBERG
Fisherman's Lake Dam	31035	TR to Ball Branch	1970	No	Briarwood Development CO
Lake Kearbey Dam	11099	TR to Sugar Creek	-	No	Dave Kearney
Lake Briarwood Dam	30400	Ball Branch	1970	Yes	Schmitt
Lembeck Lake Dam	30369	Whitehead Creek	1958	No	DR. Chang K. Yang
Little Lake Dam	30456	TR to Joachim Creek	1961	No	Sunrise Lakes Association
Lower Valle Mines Dam	30439	TR to Joachim Creek	1952	No	Valle Mining Company
Lucas Lake Dam	30454	TR to Joachim Creek	1960	No	Edwin+Thelma Lucas
Rustic Hills Resort Lake Dam	30458	TR to Joachim Creek	1957	No	Rustic Hills Resort LTD
Siesta Lake Dam	31199	TR to Fritz Creek	1957	No	Joe+Rebecca Merten
Spring Lake Dam	31193	TR-Falling Rock Branch	1976	Yes	Summerset POA
Spring Lake Dam (2)	30401	TR Ball Branch	1970	No	Briarwood Development CO
Summer Set Lake Dam	30459	Falling Rock Branch	1974	Yes	Summer Set POA
Sunrise Big Lake Dam	30457	TR to Joachim Creek	1961	Yes	Sunrise Lakes Association
Sunrise Lake Upper Dam	31190	TR to Joachim Creek	1961	Yes	Sunrise Lakes Trustees
Upper Valle Mines Dam	30370	TR to Joachim Creek	1958	No	Valle Mining Company
Valle Lake Dam	30438	Fletcher Branch	1955	Yes	Valle Lake Prop Own Assn
Winter Haven Lake Dam	31192	Falling Rock Branch	1978	Yes	Summerset POA

Fig. 2.4.13 Inventory of Area Dams

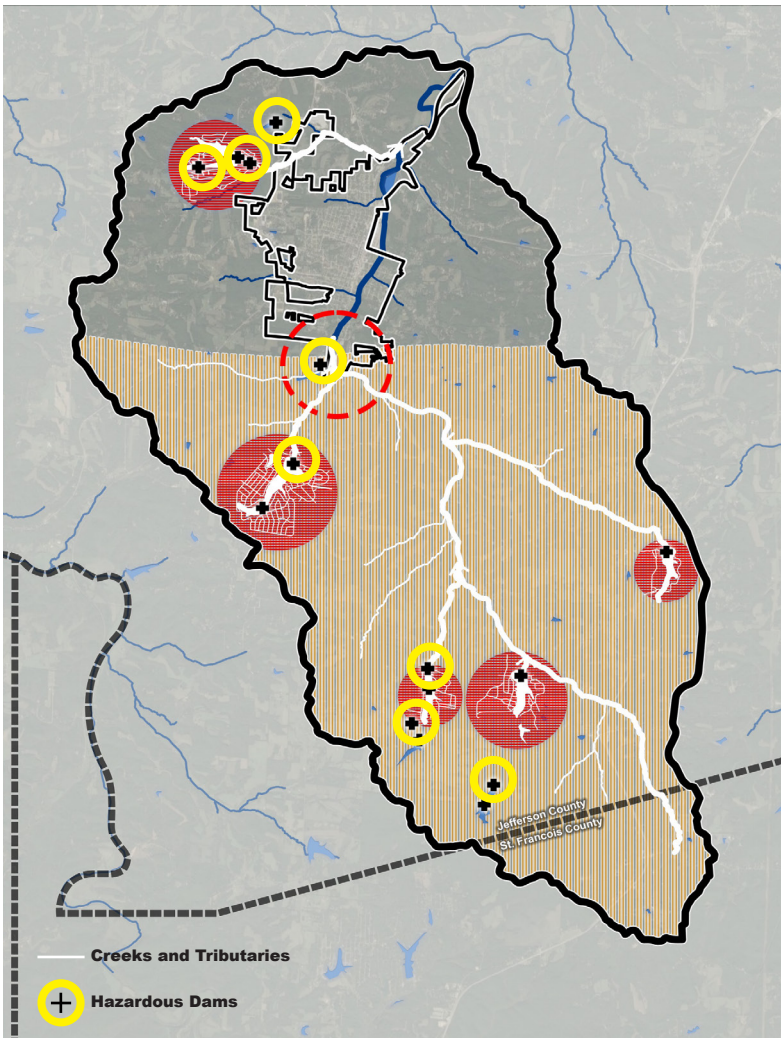


Fig. 2.4.14 Hazardous Dams Map

Height (ft)	Storage (acre-ft)	Type	Purpose	Hazard Potential	EAP	Last Inspection
34	236	Earth	Recreation	High	Not Required	5/7/1981
26	56	Earth	Flood Control	High	Not Required	-
34	236	Earth	Recreation	High	Not Required	8/2/1978
25	54	Earth	Recreation	High	Not Required	9/9/1980
65	1840	Earth	Recreation	High	Yes	3/10/2016
26	348	Earth	Recreation	High	Not Required	3/5/1981
32	68	Earth	Recreation	High	Not Required	5/8/1981
22	82	Earth	Other	High	Not Required	8/15/1980
25	94	Earth	Flood Control	High	Not Required	-
28	90	Earth	Recreation	High	Not Required	-
30	160	Earth	Recreation	High	Not Required	3/4/1981
42	178	Earth	Recreation	High	Yes	7/27/2016
20	64	Earth	Recreation	High	Not Required	8/2/1978
63	3750	Earth	Recreation	High	Yes	7/26/2016
38	168	Earth	Recreation	High	Yes	1/17/2017
37	360	Earth	Recreation	High	Yes	10/31/2017
34	291	Other	Tailings	High	Not Required	8/15/1980
39	800	Earth	Recreation	High	Yes	10/3/2017
49	301	Earth	Recreation	High	Yes	7/26/2016

Infrastructure at Risk

The greatest threat to infrastructure if a dam failure were to occur would happen in De Soto which is the only City in the watershed. Additionally, the US Army Corps of Engineers outlined the following Critical and Hazardous Facilities at Risk in entirety of the Upper Joachim Creek Watershed.

Given the nature of the facilities and infrastructure at risk in the watershed a disaster of this nature would have implications on life, the provision of emergency and medical services, and water quality and environmental health.

Economy at Risk

A significant portion of the Union Pacific Railroad is located in De Soto indicated by the map on the right. The railroad is a significant area employer and product distributor. Given a major collapse of a dam upstream, The Union Pacific railroad would expect to have to halt operations until flooding recedes. For De Soto, the biggest economic effect of a dam failure would be the impact on Main Street Commerce and resident access to employment centers given the expected regional flooding in the event of a dam failure. Specifically, the impact of highway E which runs along the Joachim Creek would sever a major transportation route for the Southern part of the Watershed.

Overall Vulnerability to Dam/Levee Failure

Vulnerability: ***High***

There are no past occurrences of dam or levee failure in De Soto to date. However, because all dams are classified as high hazard dams there is a possible future scenario of occurrence to which the Upper Joachim Watershed, De Soto, its population, and infrastructure remain highly vulnerable to.

Facility Type	Upper Joachim Creek Watershed Totals	Within 500 feet of a mapped floodplain in the Upper Joachim Creek Watershed
Chemical industry	1	0
EPA FRS Facility[1]	25	7
Cellular Towers	2	0
Day care centers	3	0
Schools (K-12)	1	0
Emergency Medical Services	5	2
Law enforcement	1	1
Cemeteries & crematories	4	3
Nursing homes	3	0
Pharmacies	4	1
Veterinarian	3	1
Wastewater treatment plant	1	1

[1]EPA Facility Registry Service (FRS) Facility identifies facilities, sites or places subject to environmental regulations or environmental interests.

Fig. 2.4.15 Infrastructure and Critical Facilities at Risk in the Watershed

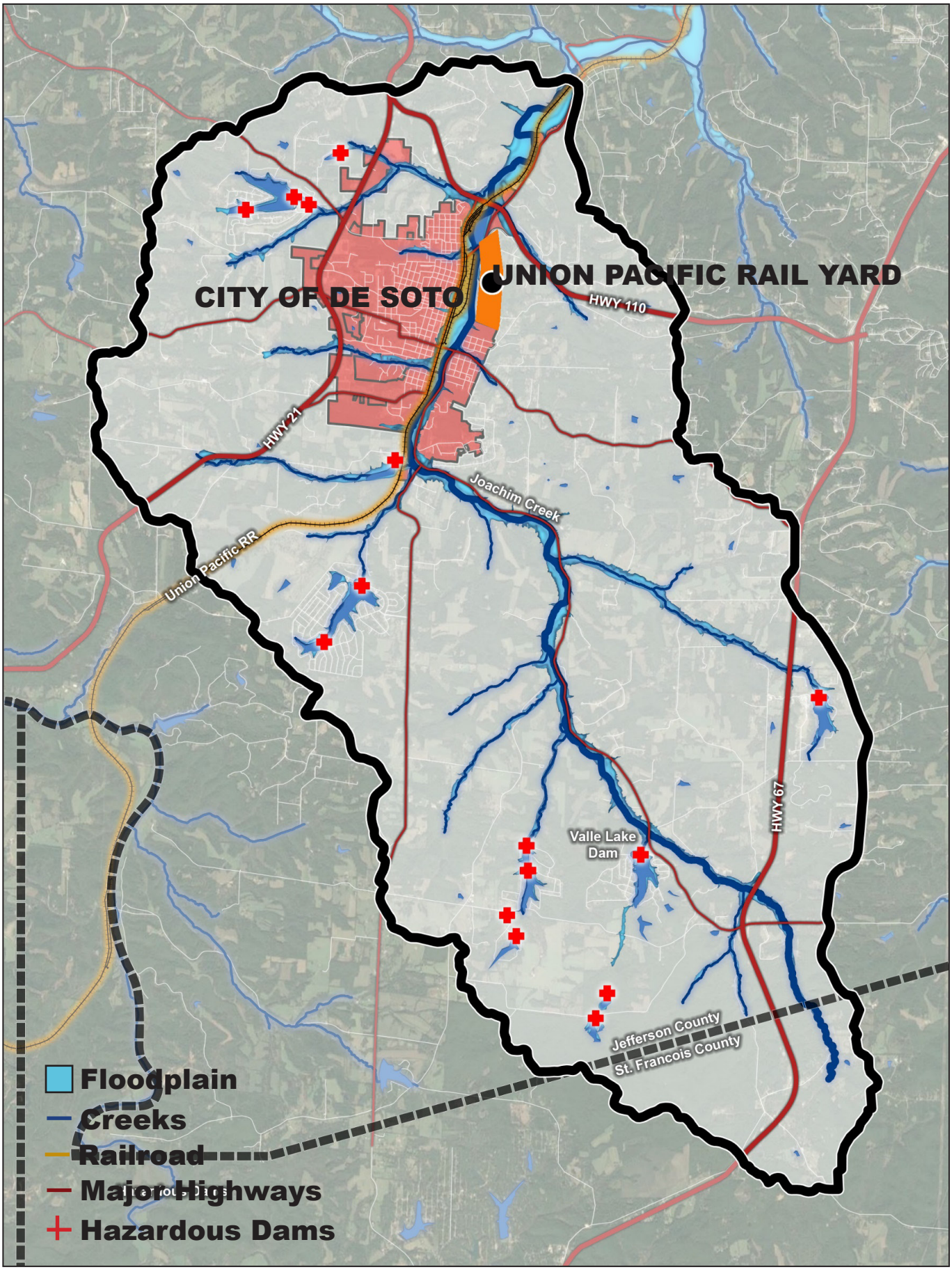


Fig. 2.4.16 Dam Map Overview with Infrastructure

Hazard: Flooding of the 100/500 Year Flood Plain

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Flood: 100/500 year	Highly Likely	Limited	Moderate	< 6 hours	> 24 hours	3.0	HIGH

The flooding of the Joachim Creek is the biggest threat to life safety in De Soto today. In the last decade De Soto has seen the Joachim Creek reach the designated 8' action stage 12 separate times averaging more than a flood a year. As the intensity of heavy precipitation events directly correlated to flooding is expected to increase in the next few decades so will the frequency of these events in De Soto and by nature the risk to the City and its community as a whole.

The nature of flooding in De Soto is not riverine, it is a flash flood condition. In a flash flood condition there is a limited warning and evacuation response time with a moderate area affected by flooding impacts. The following are impact images gathered from De Soto Flood Events in the last decade:

Fig. 2.4.17 Flood Impact Images from De Soto. Courtesy of Susan Liley.

Water Velocity

When flash floods move in the nature of the bedrock in the creek intensifies the overall velocity of the water moving through De Soto. The USGS Study indicates that flooding can occur in this area with speeds of up to 16-18 ft/second. One of the most dangerous locations is at the Tanyard Branch by the De Soto Mobile Home Park placing the mobile park at increased risk.

Water Depth

Likewise as water builds up what was once a 1-2' high creek becomes a 10-13' foot river with footprints up to 5 times wider than where it sits at a normal condition. The combined depth and velocity of the creek make the flash flooding condition in De Soto a critical risk and extreme threat to life. In past events people attempting to drive through the water have been swept away down river.

Impact of Development on Flooding

Development in De Soto's highway 21 commercial corridor also accentuate the City's flooding risks due to incoming and increased development uphill. While requirements exist to control the stormwater on site it eventually makes its way down hill through the tributaries and into the Joachim Creek. The tributary flow increases the intensity of the water and at the creek entry points where they meet the tributaries they form a combined intense depth and velocity.

Fig. 2.4.18 Flood Impact Images from De Soto. Courtesy of Susan Liley.

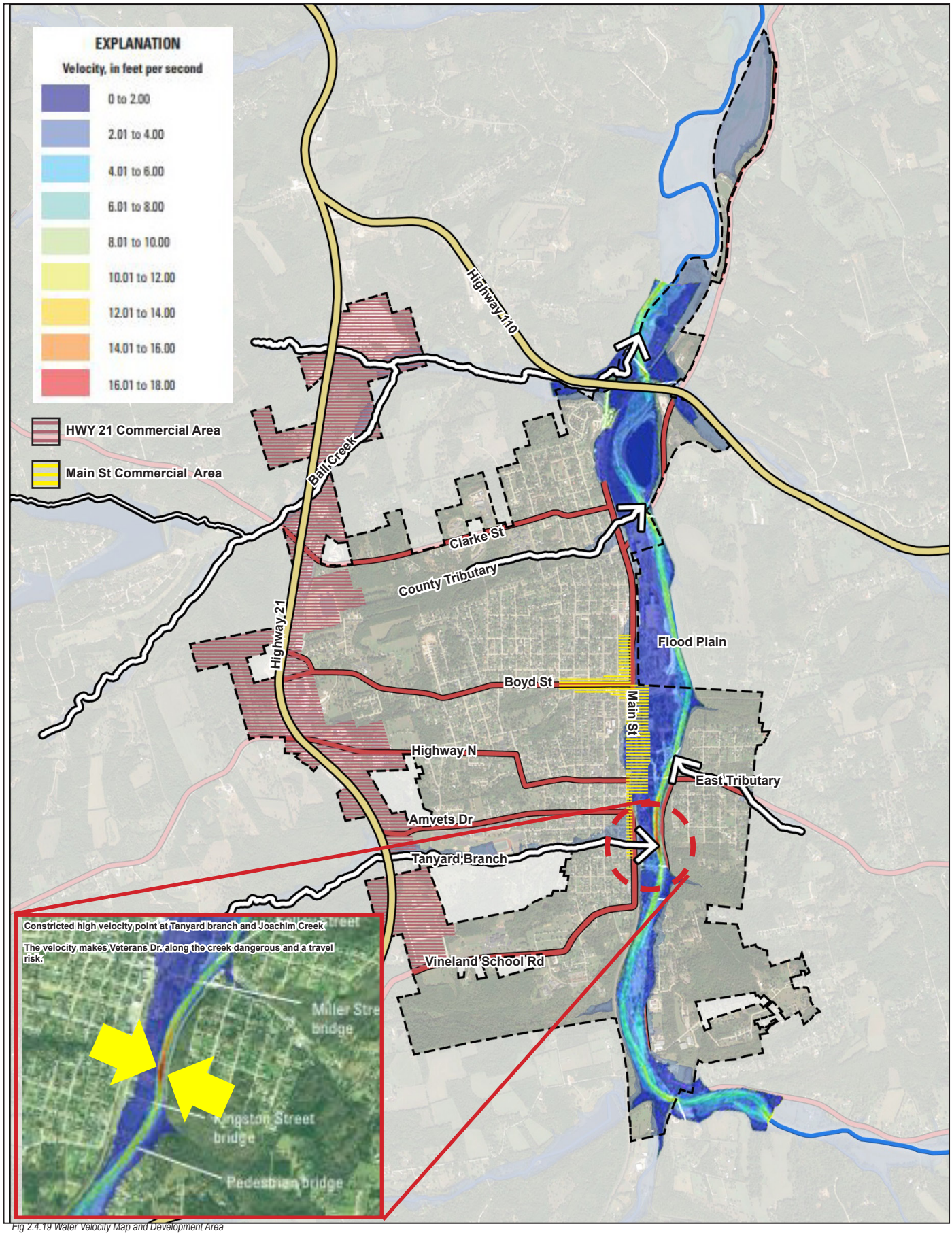


Fig 2.4.19 Water Velocity Map and Development Area

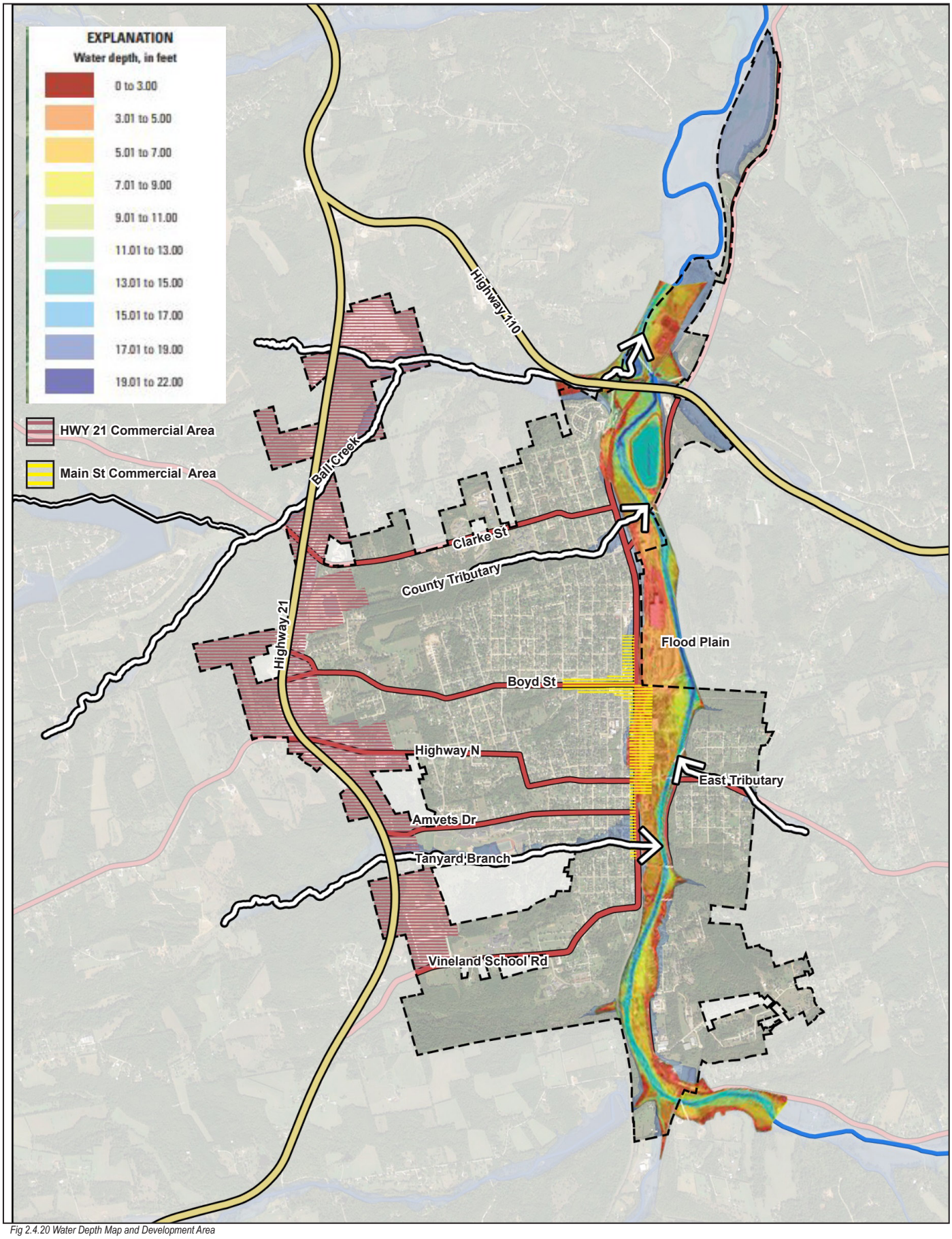


Fig 2.4.20 Water Depth Map and Development Area

For the purpose of this risk and in order to assess the impact of flooding at a parcel and building level, the flood impacted areas of De Soto have been split up into two sub areas. Sub area one is referenced at the area South of Easton Rd and includes floodplain areas South of Easton Road all the way to the Southern Boundary of the City of De Soto , The Tanyard Branch, and East Tributary. Sub area 2 is reference as the area north of Easton Rd and includes the floodplain areas north of Easton Rd. and The County Tributary. See Figure 5.19.

South of Easton Sub-Area

The southern sub-area of the floodplain encompasses 217 acres of land with 350 individual parcels and includes the southern half of Main St. De Soto, the area between the Railroad and Joachim Creek, and The Walther's Park Neighborhood Areas. The total value of property in this area based on Jefferson County Assessor Data is $23,203,670.

The area is developed into a mix of uses with:

- 48% (106 acres) of land as vacant/ agricultural land
- 31% (67 acres) of land as residential development
- 17% (38 acres) of land as commercial development
- 3% (5 acres) of land dedicated to utility and services
- 1% (1 acre) of land dedicated to civic/institutional uses

The City of De Soto owns 23% of this land on 30 parcels (approximately 51 acres). Most of the owned land is classified under vacant agricultural uses since there are four city owned parks and private property that the City buys is demolished and in perpetuity left for future open space to address flooding.

Approximately 75% of area parcels sit in area flood way, another 20% are affected by the 100 year floodplain, and the final 5% are affected by the 500 year floodplain.

North of Easton Sub-Area

The northern sub-area of the floodplain encompasses 200 acres of land with 67 individual parcels and includes the areas of the City from Highway 110 to Easton Road along Main St. and Fountain Creek Road. The total value of property in this area based on Jefferson County Assessor Data is $7,624,800.

The area is developed into a mix of uses with:

- 40% (80 acres) of land as vacant/ agricultural land
- 23% (47 acres) of land as industrial land
- 16% (32 acres) of land dedicated to utility and services
- 11% (21 acres) of land as commercial development
- 8% (16 acres) of land dedicated to civic/institutional uses
- 2% (4 acres) of residential uses

The City of De Soto owns 62% of this land on 9 parcels (approximately 126 acres). Most of the owned land is classified under vacant agricultural uses. Approximately 15% of area parcels sit in area flood way, another 12% are affected by the 100 year floodplain, and the final 63% are affected by the 500 year floodplain.

- It is important to note that the Union Pacific property is not officially in De Soto City limits. However, it is affected by the floodplain and causes choke points in the creek due to a constructed levee.

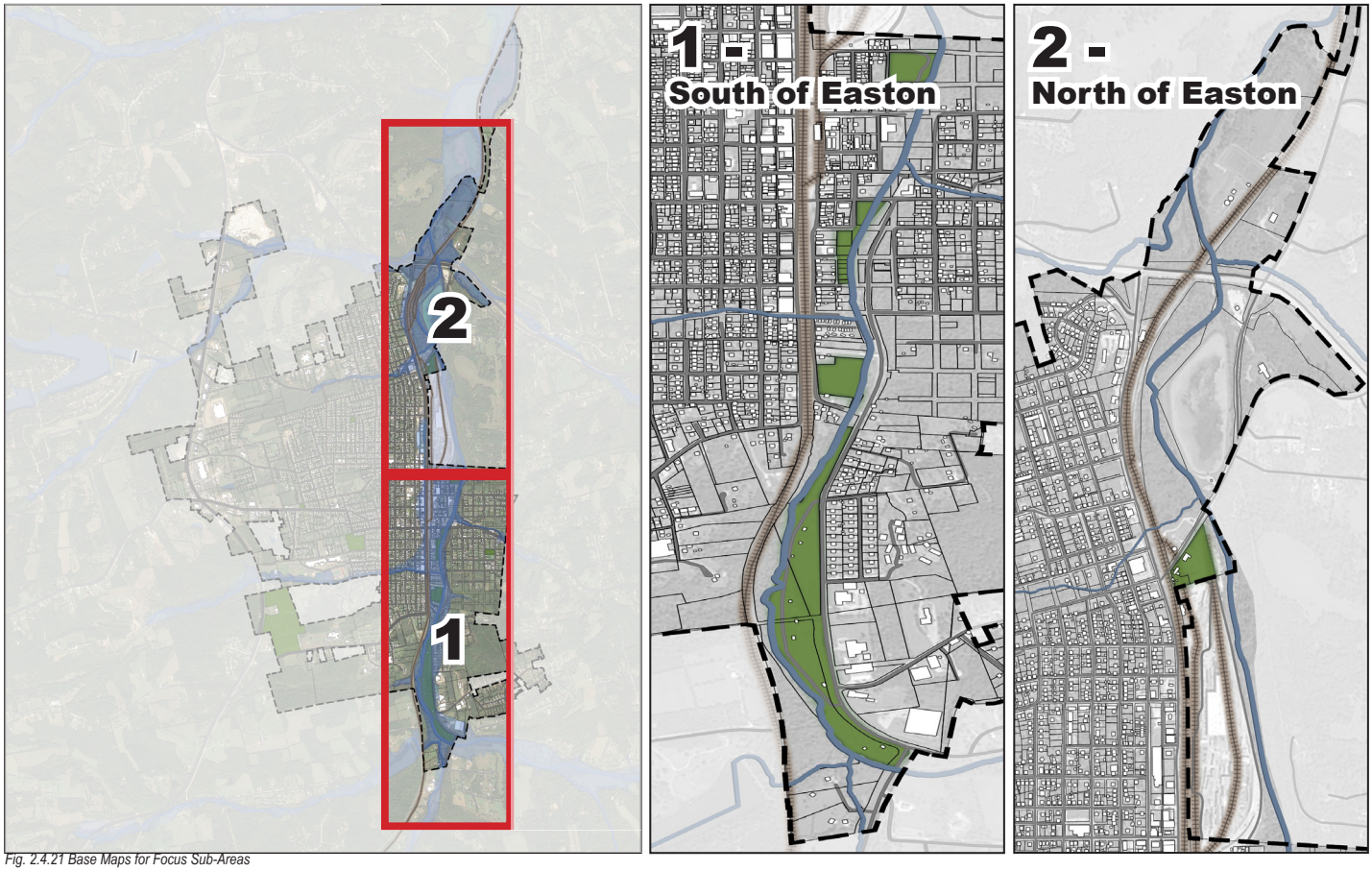


Fig. 2.4.21 Base Maps for Focus Sub-Areas

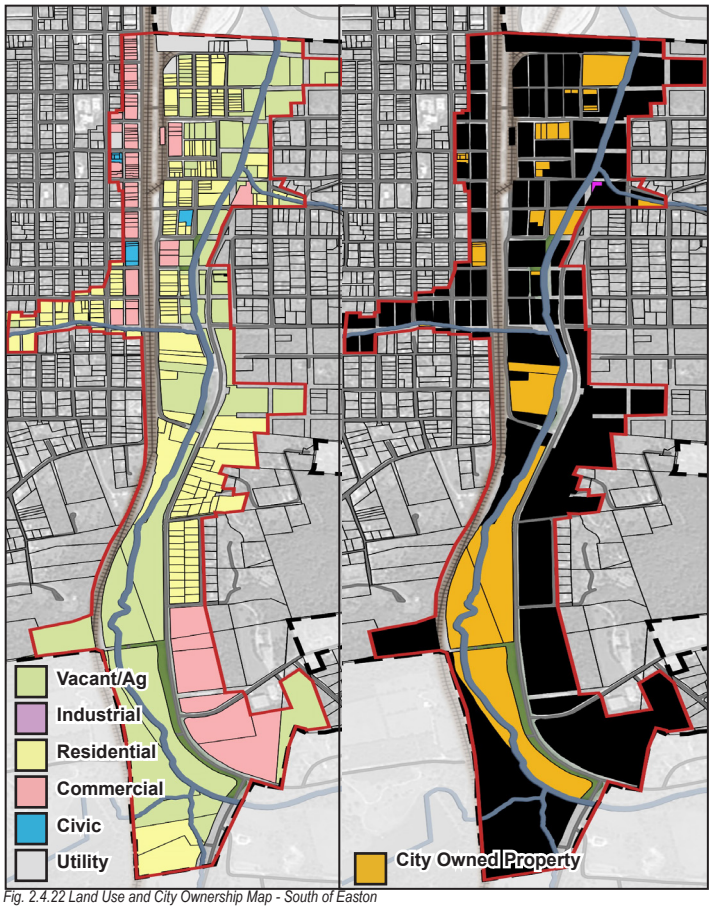


Fig. 2.4.22 Land Use and City Ownership Map - South of Easton

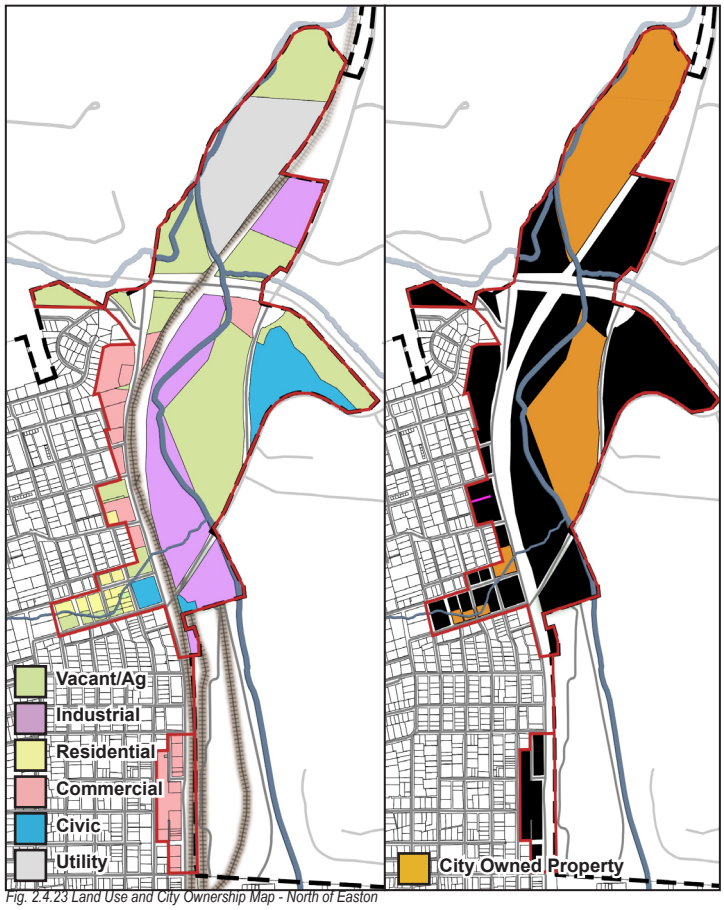


Fig. 2.4.23 Land Use and City Ownership Map - North of Easton

Neighborhoods at Risk

There are 5 main neighborhoods affected by flooding in De Soto:

- Amvets Neighborhood
- Walther's Park
- East of Main Street De Soto
- Valley Place
- Main Street De Soto

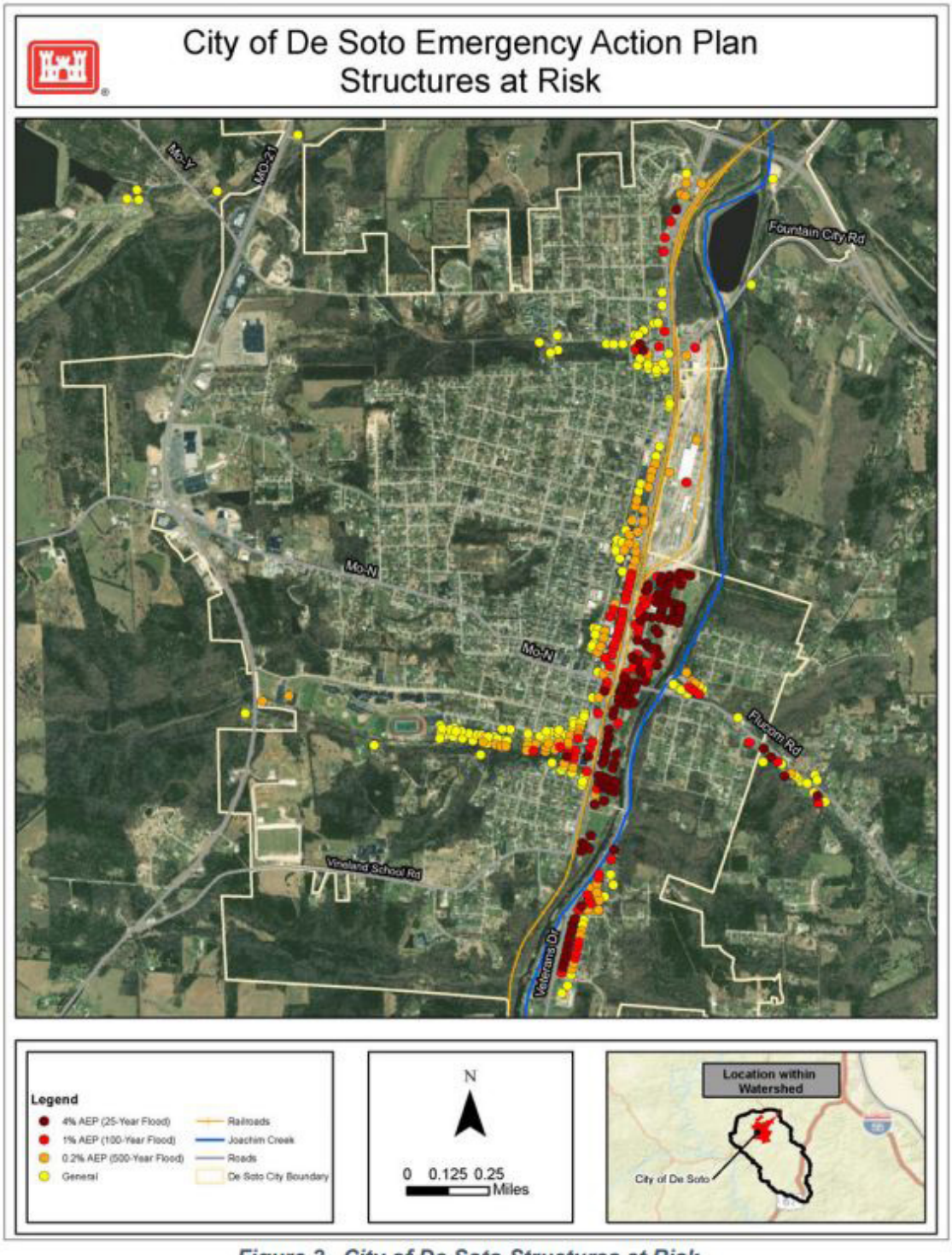


Figure 2. City of De Soto Structures at Risk

Fig. 2.4.24 Corps of Engineer Structures at Risk

Based off Jefferson County Assessor Data the total appraised value of land and buildings in the flood plain is: $31,498,570. The Corps of Engineers conducted a detailed study of the implications on the flood plain on individual residences in De Soto as shown.

According to mapping data developed by the Corps of Engineers for the 2021 Emergency Action and Evacuation Plan the floodplain structures with the greatest likelihood of flooding exist at Walther's Park and East of Main Street as they are impacted most by 25 year floods which data suggests impact De Soto more frequently. When the risk structures data is cross referenced to the depth of water it suggests that the most impacted at risk neighborhoods and structures exist in the same areas - Walther's Park and East of Main which can experience over 3 feet of flooding in any given flood event. Increased priority of assistance needs to be allocated to this corridor to address flooding.

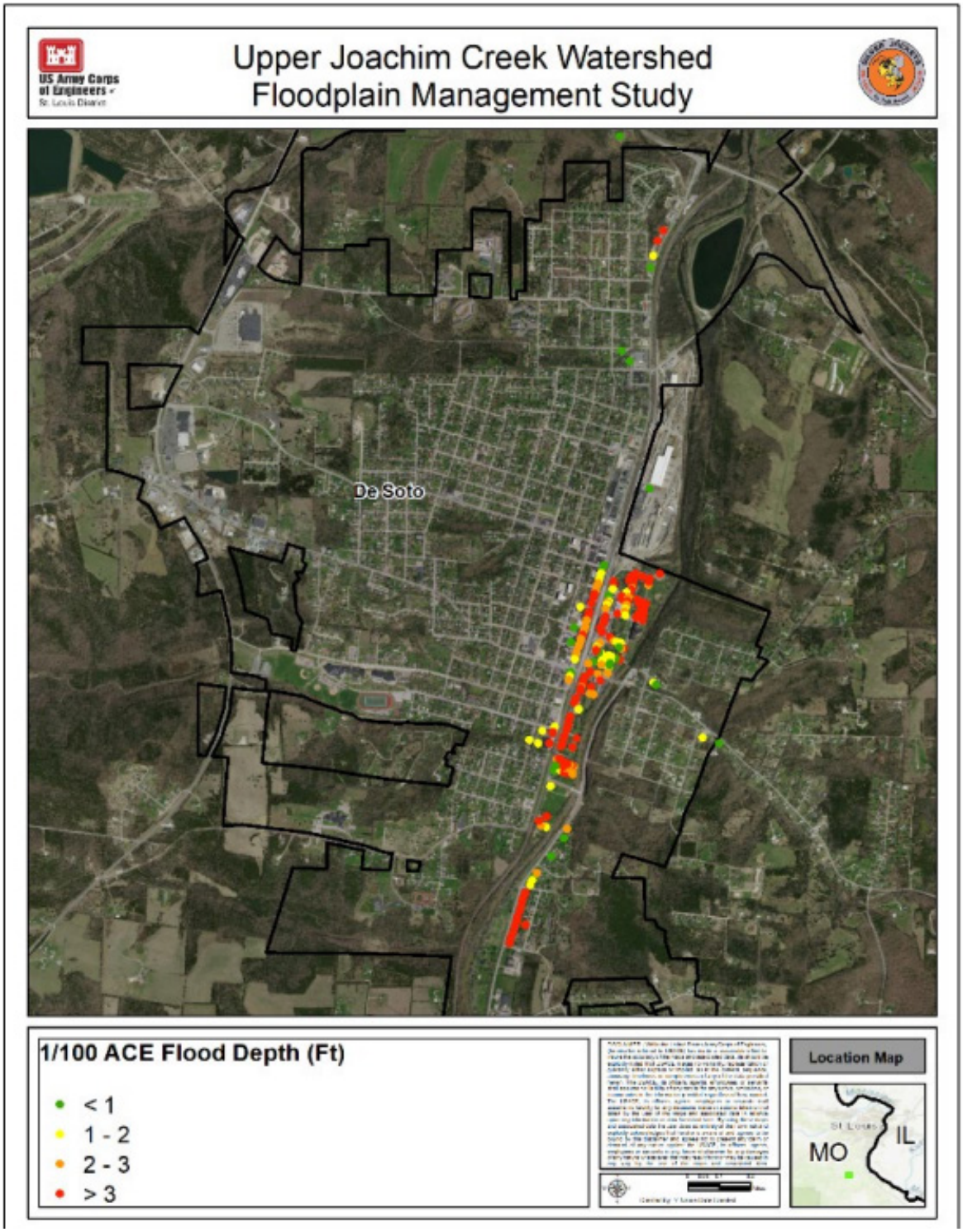


Fig. 2.4.25 Corps of Engineers Flood Impact

Infrastructure at Risk

The 100 and 500 year floodplains have a series of critical, social, and emergency management infrastructures and facilities at risk of flooding. As these properties and facilities become affected the capacity of the community and emergency management agencies to respond slowly decreases and cannot efficiently or effectively serve the De Soto community putting them at greater risk for loss of life. The following are all affected by floodplain in De Soto and the pertinent infrastructures affected are depicted in the mapping on the facing page (Fig 2.4.24 and 2.4.25).

Emergency Facilities

The De Soto Rural Fire Station is located in the flood way of the Joachim Creek and can become inundated restricting access and distribution of resources to the community. While the Valle Ambulance Station is out of the floodplain when critical roads and key bridges flood there is no access from the ambulance station which is located in East De Soto to the rest of the City. De Soto does have a local fire station for the City which is located near the Police Station and City Hall on Boyd Street. However, given the same condition of transportation infrastructure there may be a limited capacity for fire and police to assist and distribute necessary resources during times of critical flooding in the City.

Recreational Facilities

Five De Soto recreational parks and the City library are at risk in the De Soto floodplain. Richter Park, Hopson Field, Joachim Park, Walther Park, and The Railroad Workers Memorial are all within the flood way of the Joachim Creek. While minimal development exists in these parks recreational structures and debris can be easily carried away by the Joachim littering and worsening the flow overtime as sediment and debris build up.

Connectivity Infrastructure

Several key access routes are at risk of inundation in the De Soto floodplain. From an emergency management perspective some of these at risk routes are critical to administering resources when the City floods. W Miller St. and Kingston St are the only two routes that cross the Joachim Creek to access the East Side of Town and when those flood the East and West sides of the City are inaccessible to each other. Likewise several bridges within the floodable areas are at an increased risk of erosion due to the existing flood hazards and conditions and could fail if not cared for and examined for safety.

In addition to the impacted infrastructure the Corps of Engineers evaluated the condition of each of the roads in De Soto and their safety levels in times of flooding. According to the Corps of Engineers road safety map the focus of the most hazardous conditions continues to be situated East of Main and along Walther's Park with the most dangerous stretch of Veteran's Dr. near the Pedestrian Bridge.

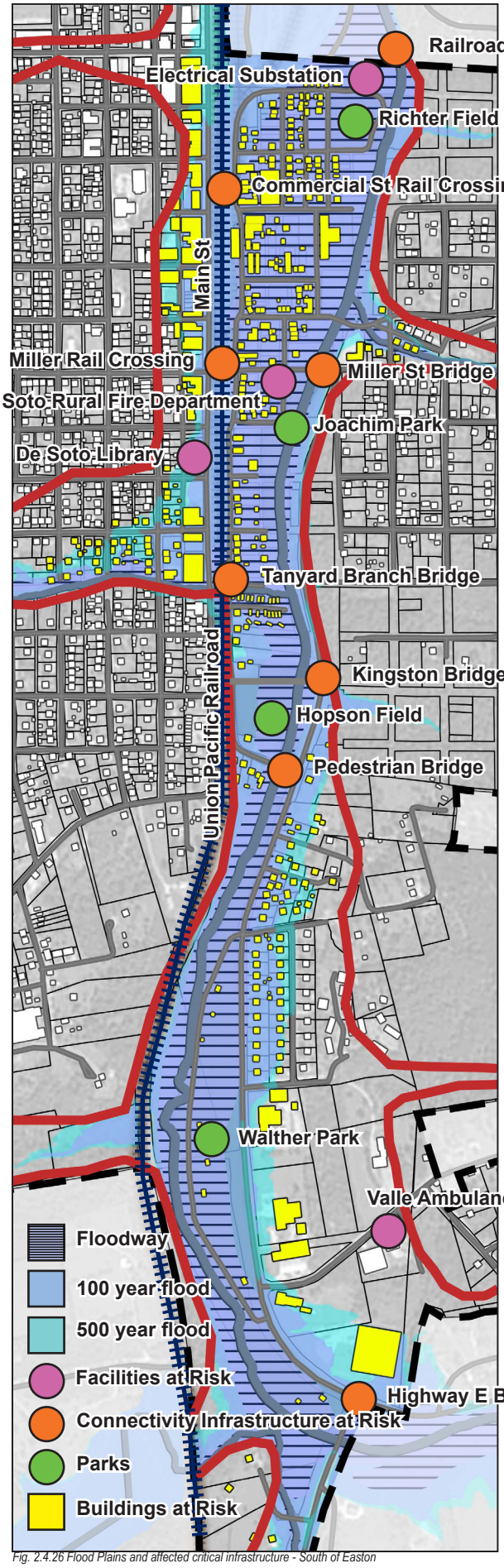


Fig. 2.4.26 Flood Plains and affected critical infrastructure - South of Easton

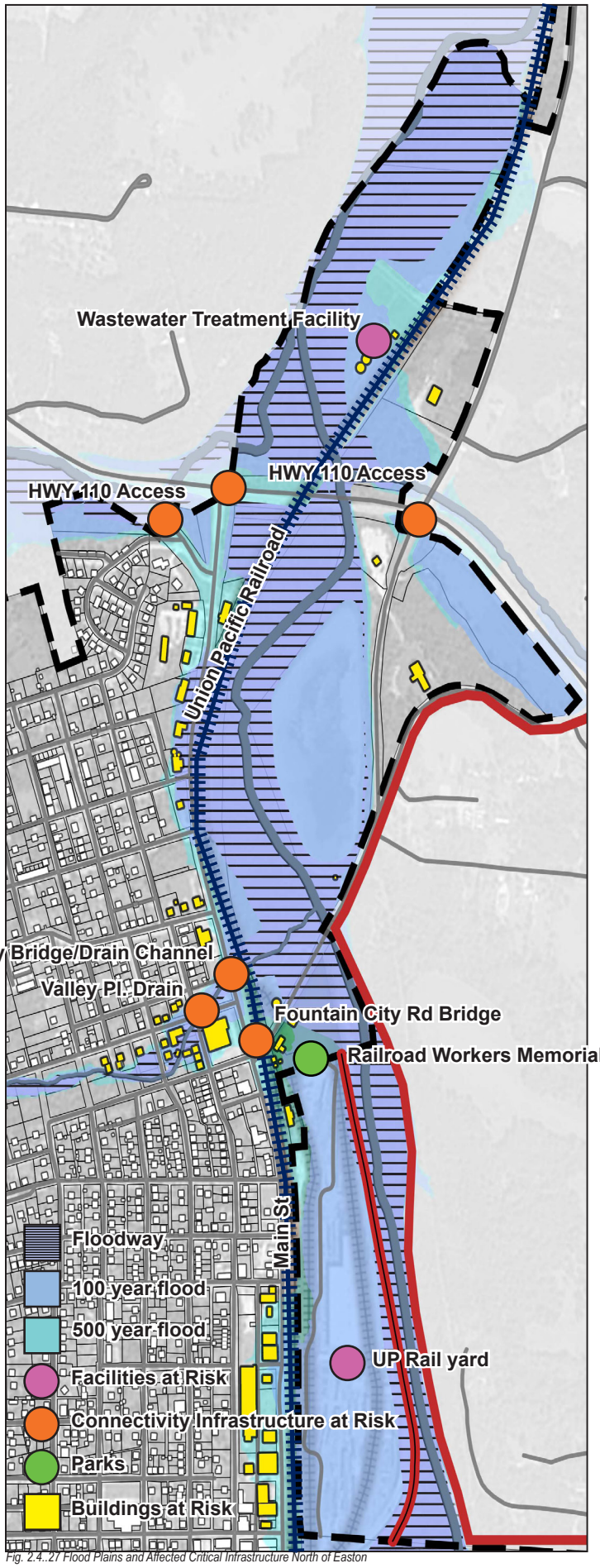


Fig. 2.4..27 Flood Plains and Affected Critical Infrastructure North of Easton

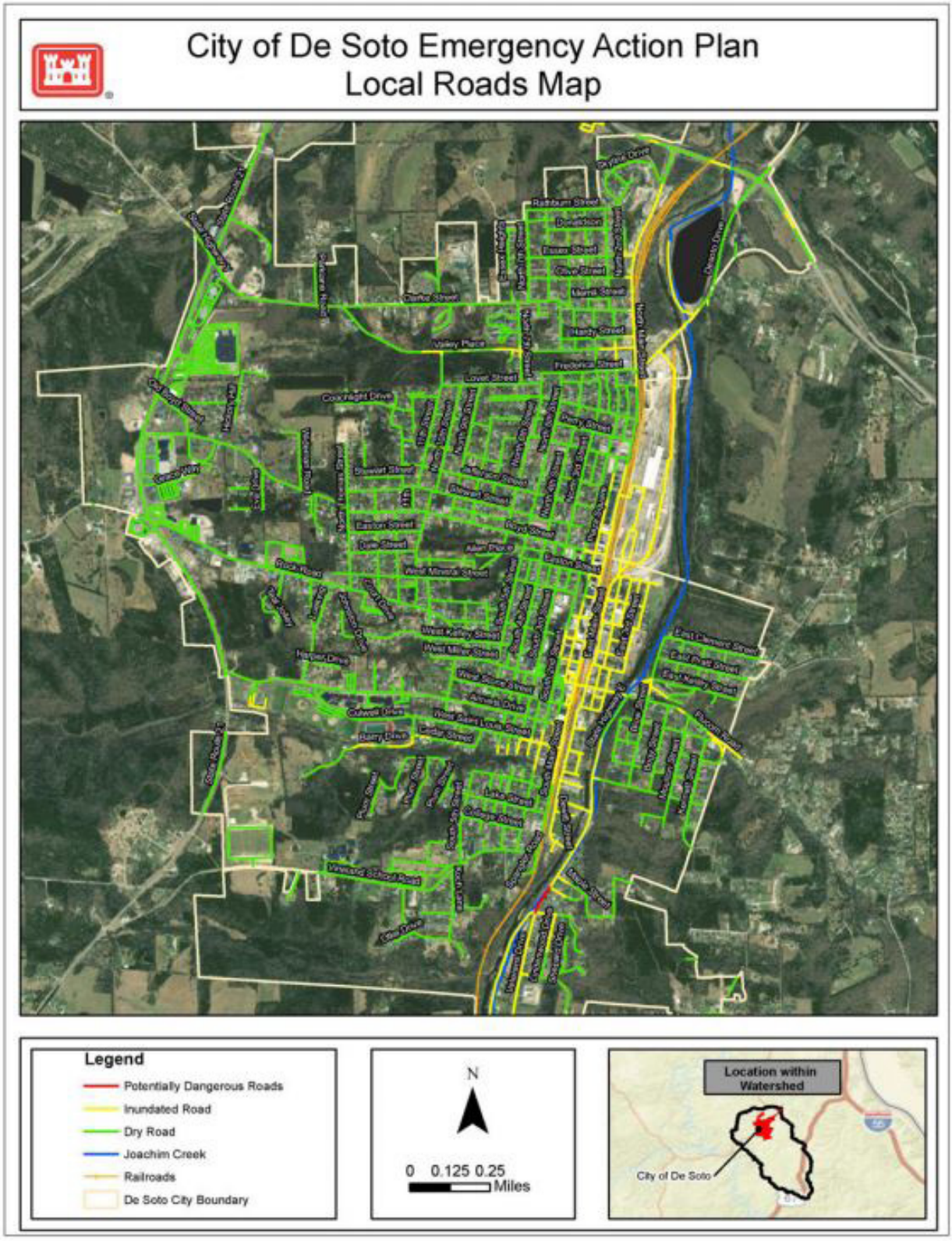


Figure 12. Roadway Inundation for the 500-year event (Main Street)

Fig. 2.2.28 Corps of Engineers Road Safety Assessment

Structures at Risk

The US Army Corps of Engineers assessed the structures of homes impacted by the floodplains per flood event to identify the overall impact on buildings in any given flood event as follows:

Table 9. De Soto Elevation Statistics (feet, NAVD)

	10-percent ACE	4-percent ACE	2-percent ACE	1-percent ACE	.2-percent ACE
Structure Count	49	128	202	229	332
Average Ground Surface Elevation	499.0	499.8	499.6	500.6	502.8
Average Foundation Height	2.6	2.1	1.8	1.7	1.5
Average First Floor Elevation	501.6	501.9	501.4	502.3	504.3
Average Beginning Damage Elevation	499.7	500.3	500.2	501.1	503.1

Table 10. De Soto Flood Depths & Velocities

	10-percent ACE	4-percent ACE	2-percent ACE	1-percent ACE	.2-percent ACE
Structure Count	49	128	202	229	332
Average Depth of Flooding (ft)	0.7	1.9	2.7	3.8	6.1
Average Velocity of Flooding (ft/sec)	1.0	1.2	1.3	1.5	1.6

Table 11. De Soto First Floor Flood Depth Statistics

	10-percent ACE	4-percent ACE	2-percent ACE	1-percent ACE	.2-percent ACE
Flood Depths Above 3 Ft	0	3	30	105	225
Flood Depths Between 0 and 3 Ft	7	77	140	106	62
Flood Depths Below 0 Ft	42	55	32	20	45
Unaffected	283	197	130	101	0

Fig. 2.4.29 Corps of Engineers Structural Impact Assessment

Likewise, the Corps of Engineers found the following resident occupancy patterns for the structures. These continue to indicate a population of 65 or greater that is very vulnerable to flood risks in the low income floodplain areas.

Population and Property at Risk

Floodplain	Daytime Population			Nighttime Population			Structures
	Under 65	Over 65	Total	Under 65	Over 65	Total	
25 Year	87	28	115	191	33	224	98
100 Year	421	77	498	479	81	560	288
500 Year	590	103	693	619	103	722	398
General	991	143	1134	833	143	976	527

*All values are cumulative
*General floodplain includes structures within 100 ft of the 500 year floodplain

Fig. 2.4.30 Corps of Engineers Population and Property Risk Overview

Economy at Risk

The major economic risk of the floodplain area occurs on Main St. De Soto which is impacted beginning at stream gage stage 12 along N. Main St. near Fountain City Road. Likewise flooding in this area can halt operations of the Union Railroad given the intensity of the flood and its impact on the railroad tracks which run parallel to Main St. De Soto.

The 100 year flood plain impacts

- 16 retail stores
- 15 professional services
- 8 vacant buildings/lots
- 5 warehouse/storage
- 3 restaurant/dining uses
- 2 civic/institutional uses
- 1 recreational amenity

The 500 year flood plain impacts an additional

- 14 professional services
- 10 retail stores
- 5 vacant buildings/lots
- 4 restaurant/dining uses
- 4 warehouse/storage
- 3 recreational amenities
- 2 civic/institutional uses

At peak flood levels, access to main street is dangerous and operations are likely to seize given the limited access and conditions of flooded non operational businesses. The affected electrical substation may affect access to electricity in this area and make flooding more dangerous given the potential of a current in the waters. Access to major roadways from Main St continuous to be inaccessible in high floods but roads from highway 21 i.e. Boyle Ave., Amvets Dr, Clarke Ave, and Rock Rd/W Miller remain unflooded and can provide close access to Main St.

Based on county assessor data the flood condition impacts $12,104,400 dollars in combined building and land value on Main Street and North Main Street. 92 businesses are at risk of flooding and shutting down operations once water begins reaching stream gage level 12’

Union Pacific Railroad is the City of De Soto’s single largest employer and major source of capital. At 13’ gauge their rail yard begins to flood as well as tracks in their property. Between 14’ and 15’ gauge the primary lines running along main street begin to flood putting operations at a halt limiting revenue and working capacity for citizens of De Soto.

The following spread of pages demonstrates the impact of flooding on the City of De Soto by gauge level.

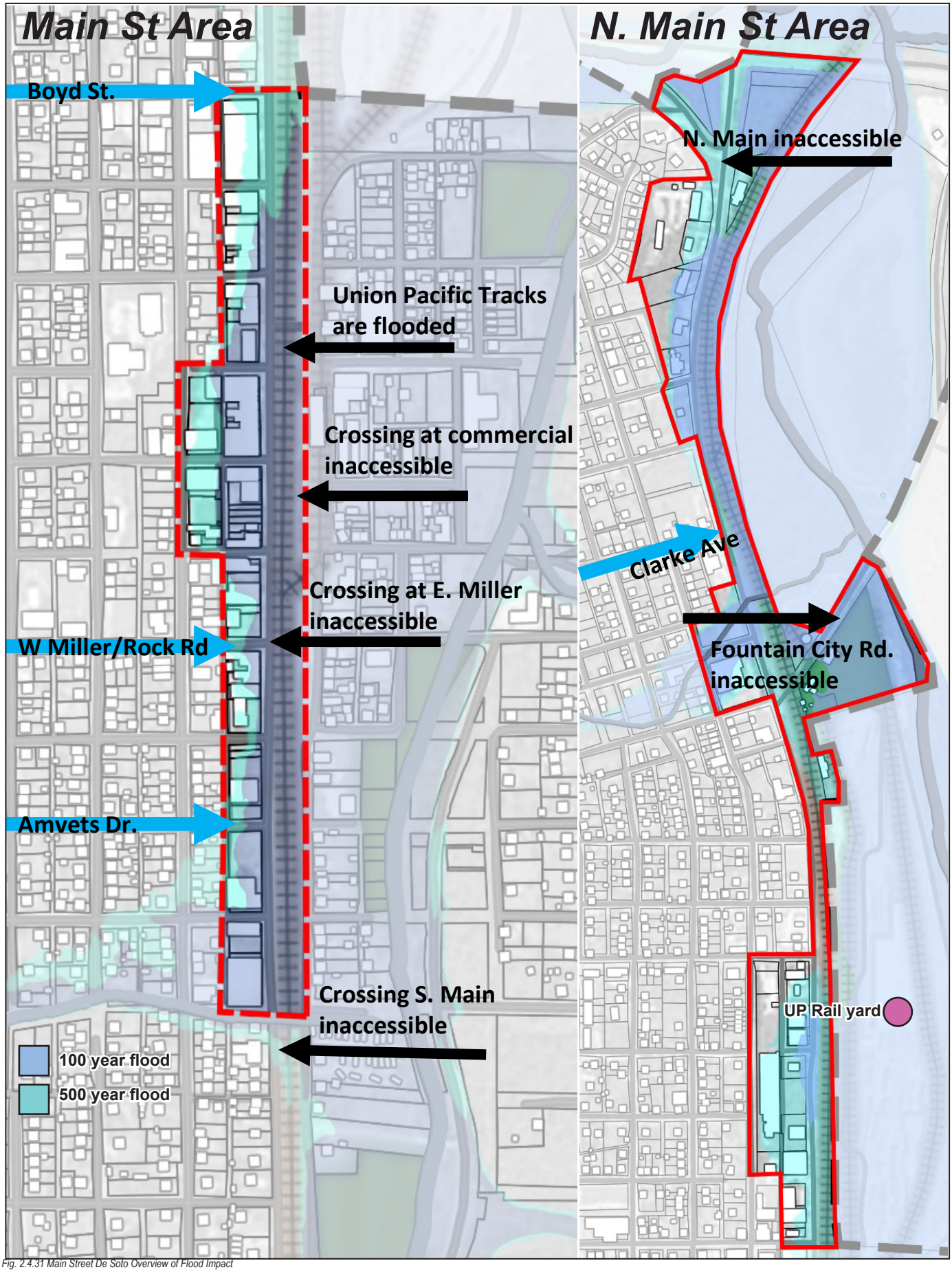
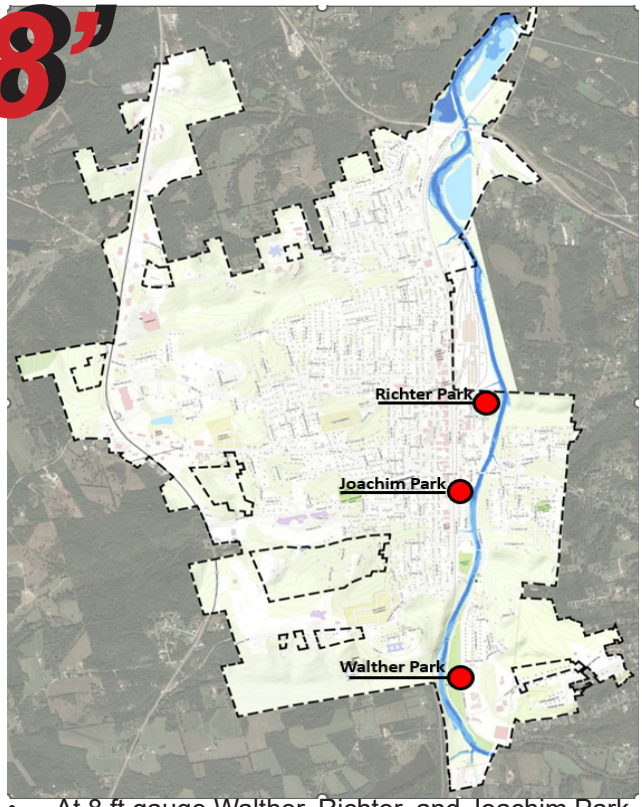
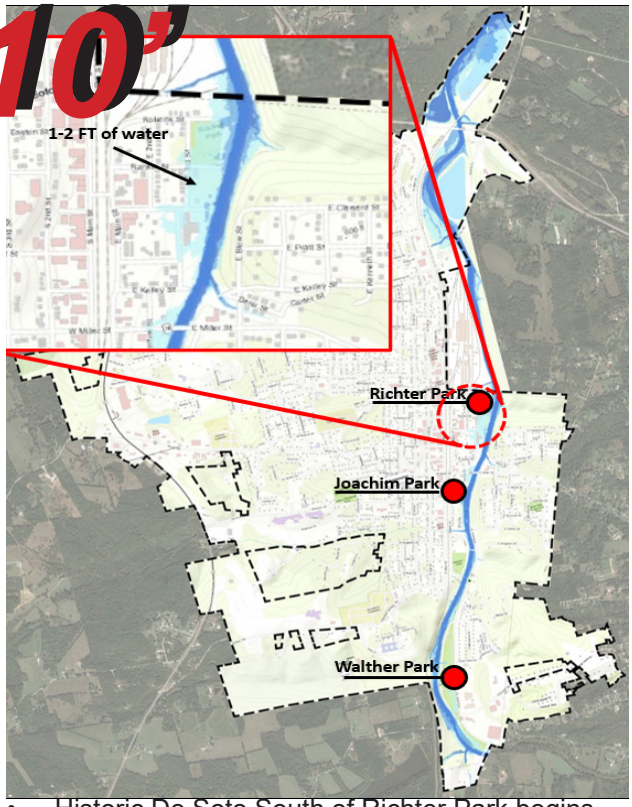


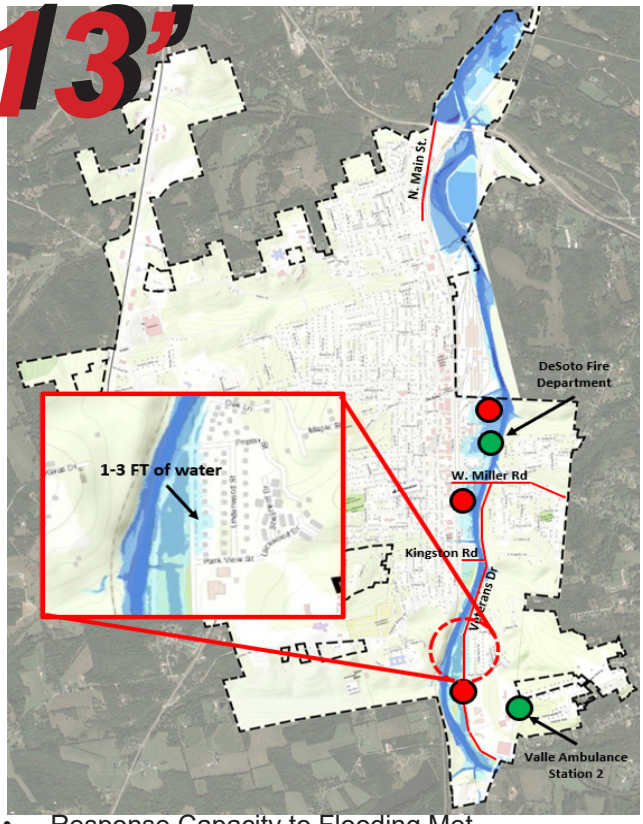
Fig. 2.4.31 Main Street De Soto Overview of Flood Impact



- At 8 ft gauge Walther, Richter, and Joachim Park begin taking on water inhibiting access and use.
- Door knocking and Code Red activated.

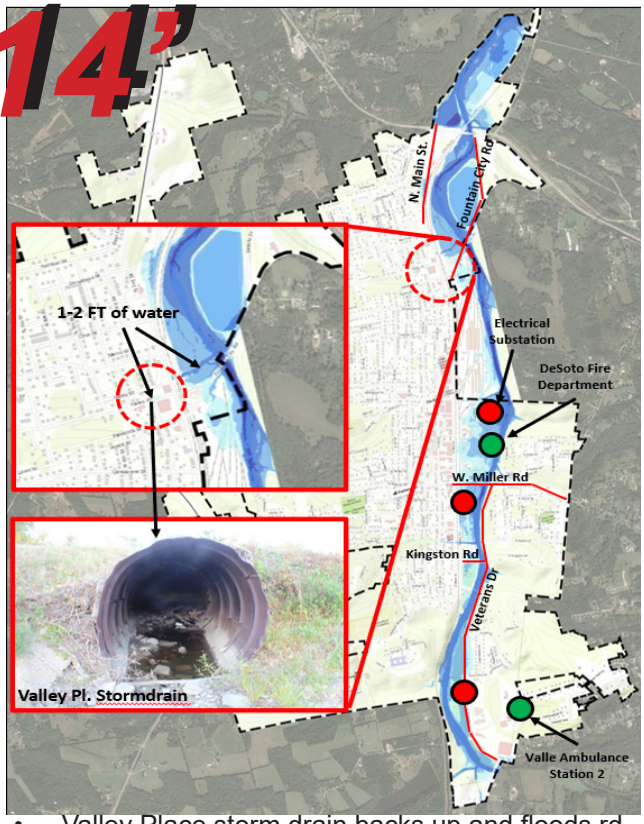


- Historic De Soto South of Richter Park begins taking on water.
- Residential properties begin flooding.
- Rural Fire Station Evacuated



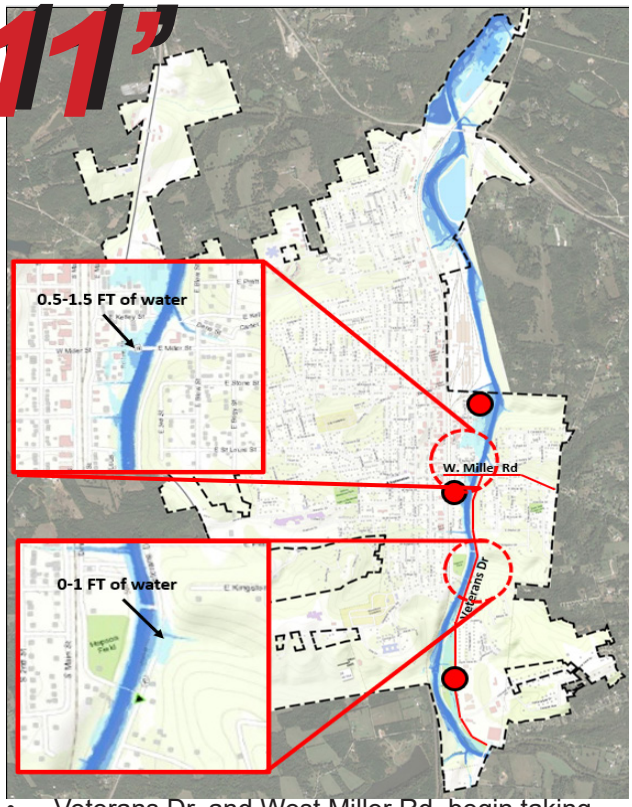
- Response Capacity to Flooding Met.
- Kingston Rd Floods cutting access from Veterans Dr to Dewitt.
- The neighborhood across from Walther Park begins flooding.

Fig. 2.4.32 – 2.4.39 Progression of Flood Impact by Gauge Level

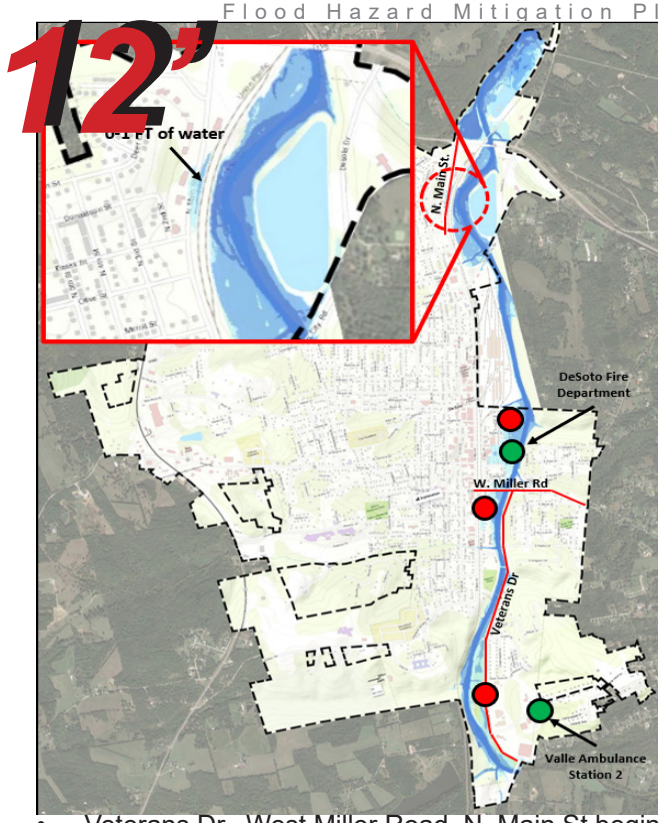


- Valley Place storm drain backs up and floods rd.
- Fountain City Road begins flooding cutting off remaining access to highway 110.
- The electrical substation near Richter park begins taking on water cutting power to properties

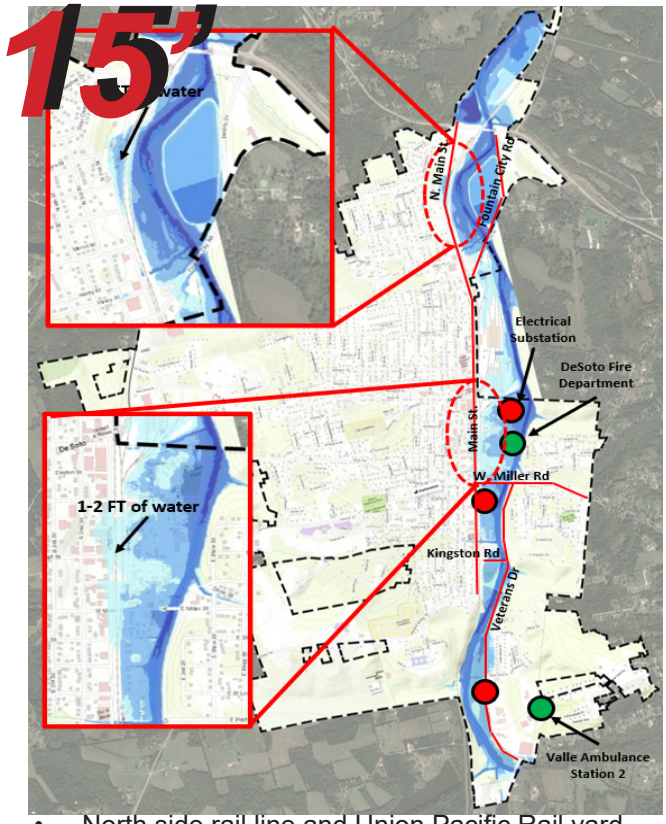
Fig. 2.4.32 – 2.4.39 Progression of Flood Impact by Gauge Level



- Veterans Dr. and West Miller Rd. begin taking on about 0.5’ – 1’ of water.

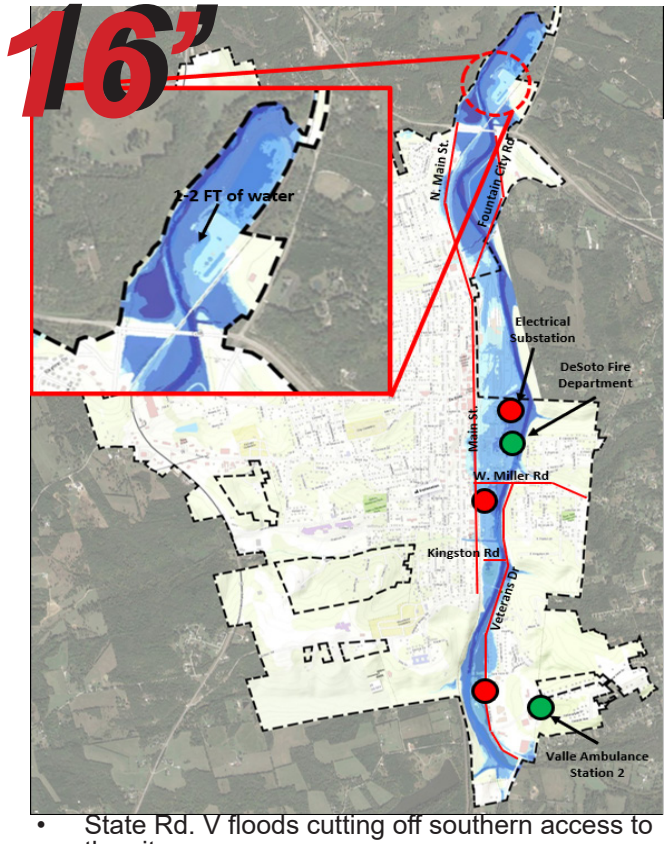


- Veterans Dr., West Miller Road, N. Main St begin flooding with ranges between 1’ and 3’.
- Flooding of Veterans Dr. lead to limited access to Valle Ambulance station two.
- N. Main St. begins flooding cutting off HWY 110 access. Main St. shuts down to traffic.



- North side rail line and Union Pacific Rail yard begin flooding.
- Main St. begins flooding
- Pedestrian footbridge at water gauge begins to flood

Fig. 2.4.32 – 2.4.39 Progression of Flood Impact by Gauge Level



- State Rd. V floods cutting off southern access to the city.
- The Water Treatment Facility begins flooding

Fig. 2.4.32 – 2.4.39 Progression of Flood Impact by Gauge Level

Overall Vulnerability to Flooding of the 100/500 Year Floodplain

Vulnerability: ***High***

De Soto experiences a high risk to flooding at the 100/500 year floodplain. It is highly likely that flash flooding in these conditions will continue to occur in De Soto proving little warning to residents. The most vulnerable areas to this kind of Flooding are Walther's Park and East of Main whose structures and residents see the highest levels of flood waters with the greatest number of impacted structures. Following the next must vulnerable area would Main St. While Valley Pl and The Amvets Neighborhoods see conditions of localized flooding due to the tributaries it has been indicated that stormwater projects are incoming for the areas to address the impact of flooding and reduce the existing risk. The highest risk for flooding continues to be to older lower income communities with little to no capital for resiliency implementation at the individual property level.

Hazard: Stormwater Backups

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Stormwater backups	Likely	Minor	Small	< 6 hours	< 24 hours	2.2	MODERATE

Given De Soto's hilly topography stormwater systems are critical to managing the large volumes of water that contribute to localized flooding in down hill areas. The nature of localized flooding in De Soto is primarily due to excess runoff from heavy precipitation along impervious surfaces. These events can overwhelm the storm drainage system in the City and cause backups. Additionally, increasing development on highway 21 which is at the peak of the city hills contributes to increased stormwater runoff and intensifies localized flooding in De Soto.

While De Soto has an underground stormwater system many of the stormwater drains run into designated open channels made up of the tributaries. Several of these tributary channels are open systems and end up flowing over the streets due to the low capacity of several channels to hold water. Eventually, the stormwater systems all end up in the Joachim Creek contributing to intensified flooding conditions in the City Floodplain and the effects to the neighborhoods within it.

The following conditions of the stormwater system have been described to contribute to localized flooding and backups in De Soto by residents and City officials throughout the engagement process:

- ***Low Capacity***: an undersized system can cause water to back up behind a structure which can lead to ponded areas of water.
- ***An aging stormwater system:*** Outdated pipes have a lower capacity to hold water can often break causing issues to the flow of water.
- ***Clogged Inlets***: Debris traveling down the tributary channels and drain systems causes clogging and improper flow of water leading to pooling.
- ***Blocked/Capped Drainage Outfalls:*** Since the drainage system flows into the Joachim Creek when the creek is flooding this can cause a backup internal to the stormwater system. Likewise, debris traveling down channels and through the creek can contribute to structural damage and blockages limiting the discharge of water into the basin.
- ***Improper Grade:*** Many of the channels have limited capacity and poorly graded asphalt around pipes and inlet points which create ponding and disrupt the flow of water to the primary drainage channels of the City.

It is important to note that while De Soto continues to experience localized flooding due to infrastructure challenges the City has taken up improving stormwater infrastructure as a major initiative of the public works department. In the last decade De Soto has lined over 21 miles of sewer mains, had over 1100 manholes strong sealed to reduce inflow backups, corrected

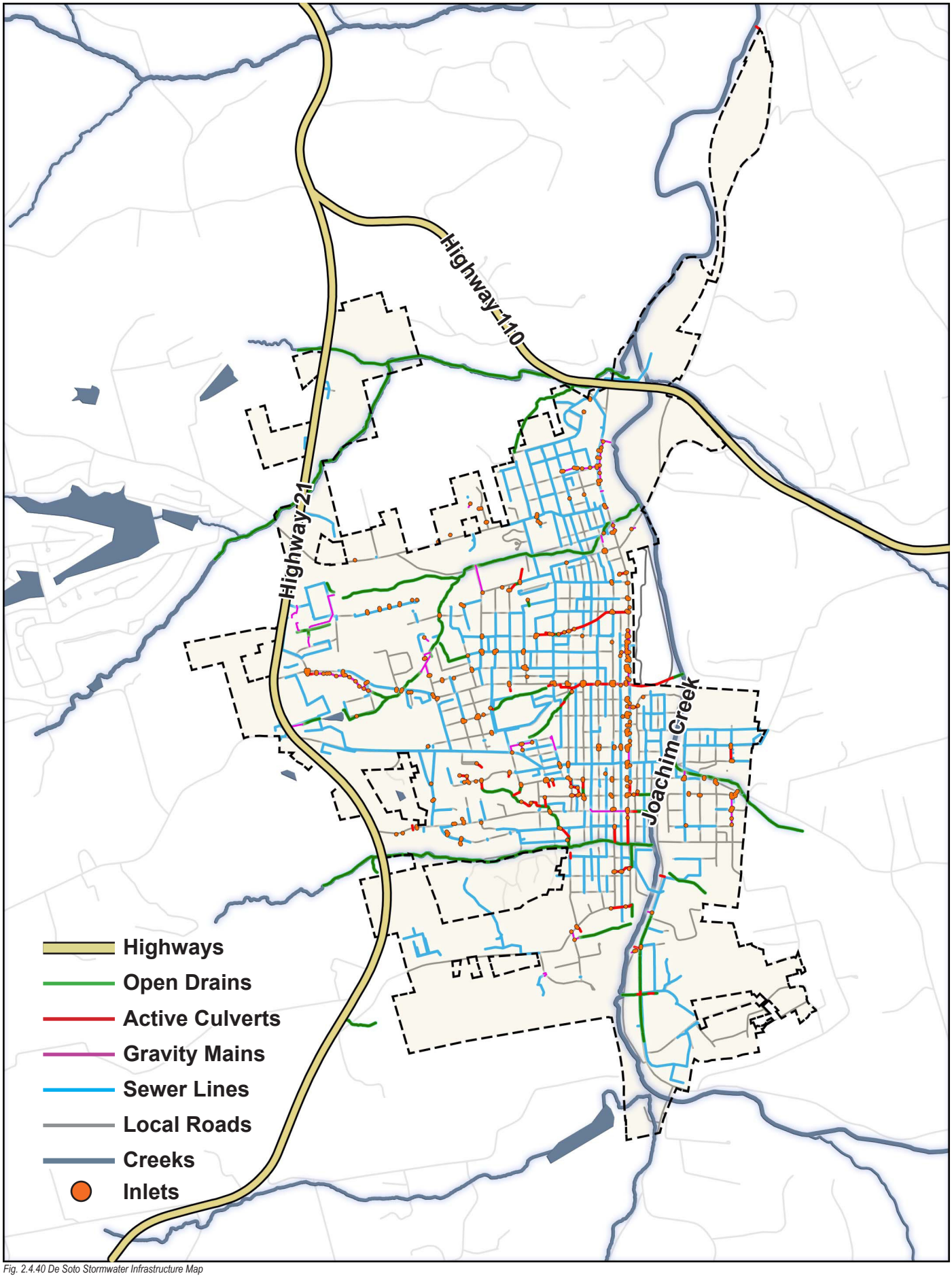


Fig. 2.4.40 De Soto Stormwater Infrastructure Map

infiltration issues, completed three major stormwater infrastructure projects to mitigate roadway runoff, allocated CDBG funds to reline and repair outdated systems, they passed a tax dedicated to contributing to park and stormwater infrastructure, and they plan to daylight and reconfigure the Vally Place intersection which is a critically dangerous intersection due to the pooling of water when it rains.

Areas at Risk

There are four critical at risk areas of localized flooding due to stormwater in De Soto. There is the Valley Pl. intersection, Main St. De Soto, The Tanyard Branch outfall, and Walther's Park Neighborhood. In addition to these three key areas improper grading occurs generally throughout several areas and along key roads in De Soto.

Valley Place Intersection: Valley Place intersection is the location of a large scale drainage tube that runs underground and discharges across Main St. De Soto under the railroad bridge. On an average day condition, the road and open channel are both dry but in both low and heavy precipitation events, the intersection can become dangerously flooded flowing as quickly and with as much volume as any small creek or river. In the past, people that have attempted to cross the flooding zone have been swept up into the drain and lost their lives. A house which once sat adjacent to the area had previously collapsed due to erosion from the speed and volume of water that passes through it. This is the only place in De Soto with gates to close off at the time of flooding. Upon site observation, the team observed the following challenges to the area:

- The drain was clogged and had debris of large branches which could disrupt the flow of water and increased backups at peak precipitation events.
- Asphalt and concrete have been unevenly poured to correct erosion issues at the bridge and roads.
- The street sinks at key inlet points and the primary crossing of water.

Main St. De Soto: Business owners expressed that in recent years flash flooding has not reached a level that impacts Main St. De Soto. Main St. is instead affected by localized flooding due to storm water backups from clogged inlets. For context, Main St. De Soto is located at the bottom of several of De Soto's hills and much of the runoff eventually ends up at an inlet on Main St. or Second St. These inlet points tend to become clogged with debris causing localized flooding which impacts and puts businesses at risk.

Tanyard Branch Outfall: The Tanyard Branch Outfall is the point along the Joachim Creek where the highest velocity of water located. The Tanyard Branch intersect the creek perpendicularly at this point disrupting the flow of water and causing localized flooding from the Tributary putting the mobile park at risk.

Walther's Park Neighborhood: Walther's Park is one of the first flood impact points given that it is at the entry of the creek where the convergence of three streams occurs along the Joachim. Within the park the homes have primarily open drains that release water into the Joachim Creek. Since the outfall point of several of these drains is so low to the level of the Creek backup quickly takes place impacting the residents and homes along Veterans Dr. at the edge of the park. Additionally, given the natural structure of the drains debris piles up quickly impeding the proper flow of water from the site creating localized flooding conditions.

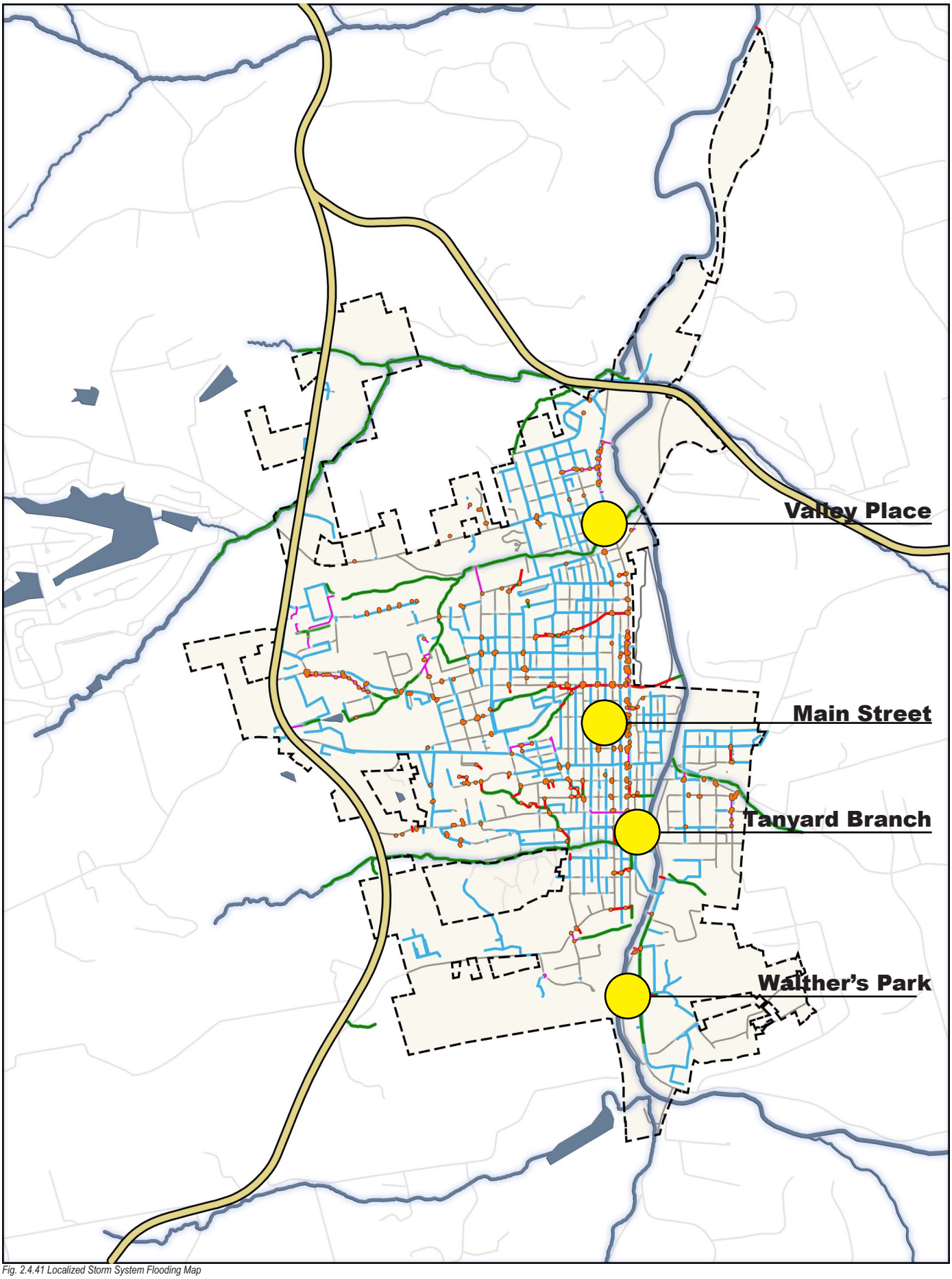


Fig. 2.4.41 Localized Storm System Flooding Map

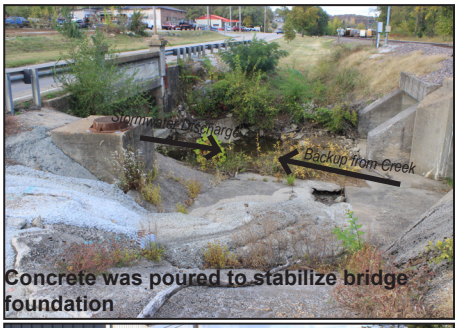
Infrastructure at Risk

Valley Place

At the Valley Place Intersection there are 10 total structures at risk, 1 of which is a civic building and 9 of which are residential structures. Also at risk is one bridge on Main St. which has shown signs of erosion and cracking. The County Tributary feeds the water system of the open channel collecting runoff from uphill development on 21 and residential neighborhoods along the way. The stream crosses under the roads at 3rd St., 2nd St., and Valley Place, but the channels are so narrow that capacity often can't allow the flow and water ends up running over the road surface instead posing increased risk to road infrastructure as demonstrated at point 1 on the map where water marks are visible. These drains also tend to become easily clogged with debris.


Valley Place Pipe clogged


Discharge channel and bridge with erosion and cracking



Concrete was poured to stabilize bridge foundation


Drain Pipe covered over with concrete at the bridge


Grate over the Pipe


The channel releases water on Valley Pl.

Fig. 2.4.42 - 2.4.47 Valley Place Infrastructure Images

Main Street De Soto

Several Main St. Businesses are at risk due to stormwater backups. In particular the Central block of Main St De Soto businesses expressed that the areas around second street behind their businesses clog up quickly and impede the flow of water. 92 businesses are at risk of localized flooding in this area as well as Main St and the Union Pacific Railroad. Though a majority of inlets exist in this area discharge from the hills can easily be overwhelmed.


Storm Drains at edges or rail


Storm Drains at edges or rail


Storm Drains on Main St

Fig. 2.4.52 -2.4.54 Main St. Stormwater Infrastructure

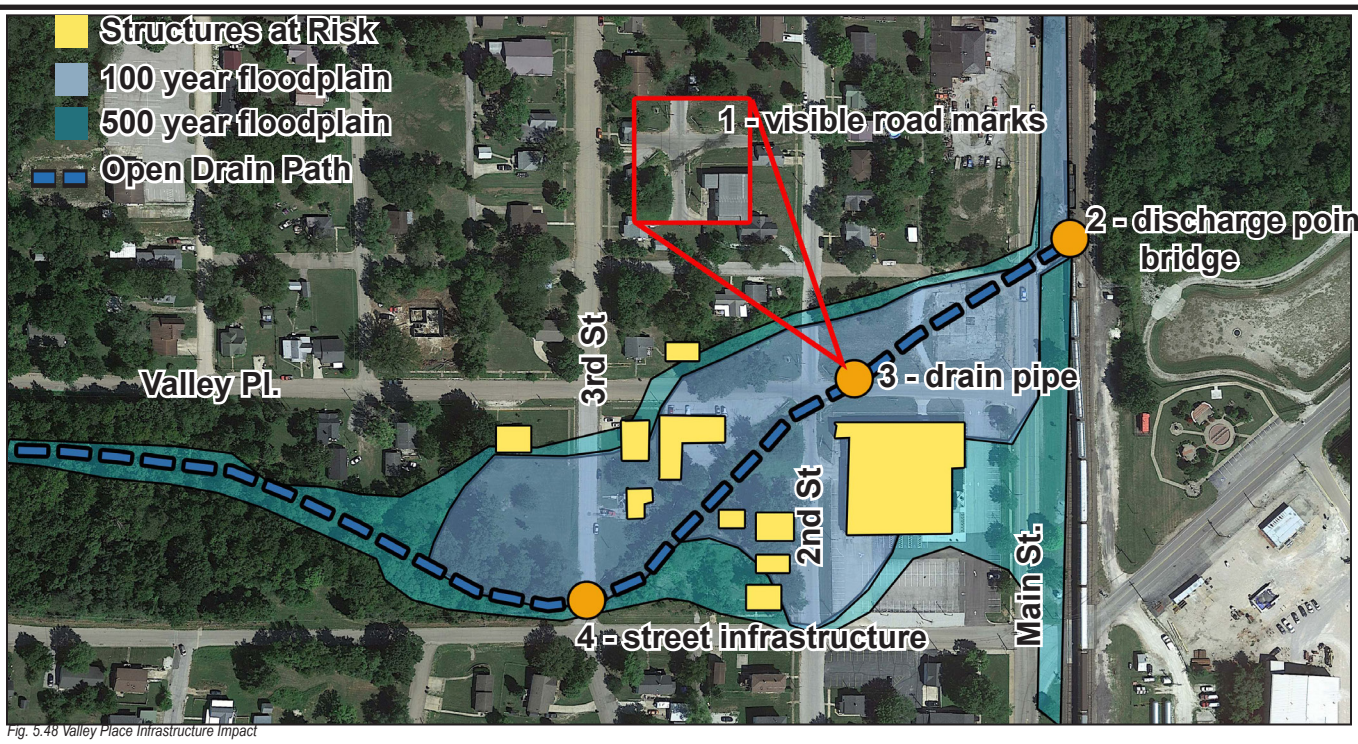


Fig. 5.48 Valley Place Infrastructure Impact

Water typically runs over the road into the drain pipe in picture 1.

Damage after a flood at Valley Place, Flood Gates are closed to keep people out.

Fig. 2.4.49 - 2.4.51 Valley Place Infrastructure Images

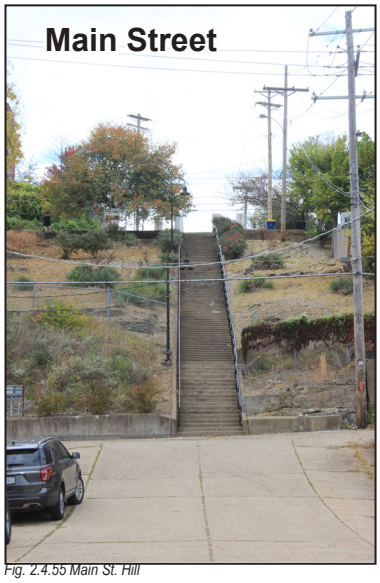


Fig. 2.4.55 Main St. Hill

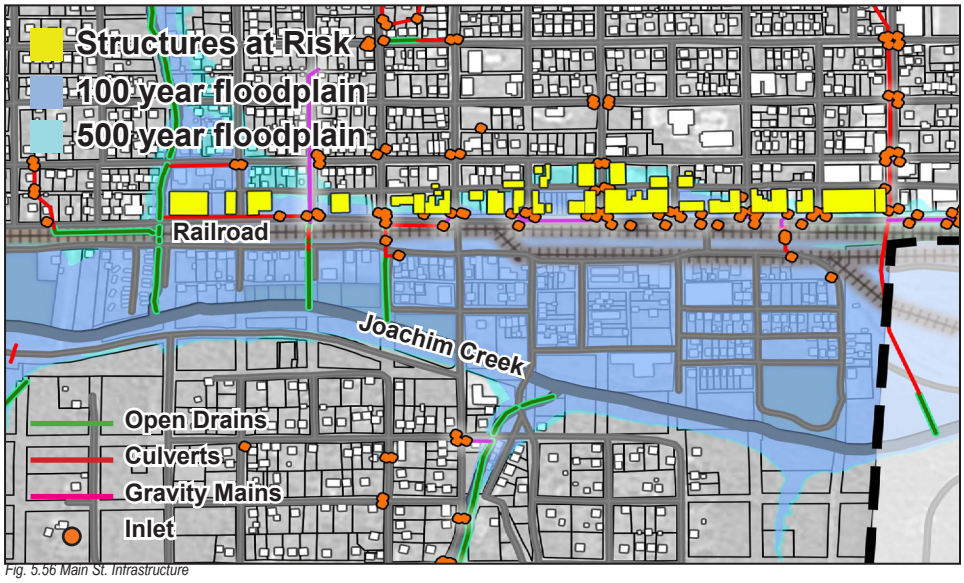
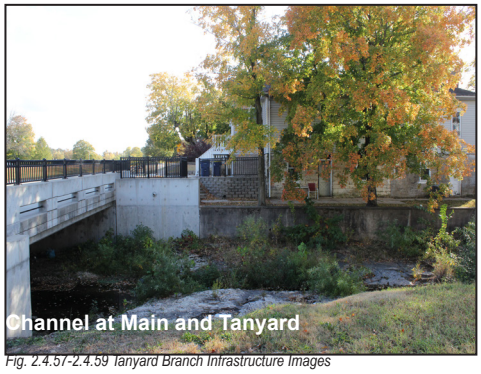


Fig. 5.56 Main St. Infrastructure

Tanyard Branch Outfall

The Tanyard Branch presents an increased risk to 68 of structures including 3 businesses, The De Soto High School playing fields, and parking lot, The De Soto mobile home park, The VFW, and 60 residential structures. Main St. at the Tanyard branch had a bridge inserted recently to improve the flow but as the creek rises the Tanyard branch backs up affecting the residences along it. Erosion can be seen at the banks of the mobile home park creating a life safety risk to its residents along the creek. Residents indicated the low lying neighborhoods along the Tanyard branch do not have an adequate stormwater system to carry water away from the homes. Additional culvert and drains from uphill neighborhoods also empty out in these low lying areas and back up.


Channel at Main and Tanyard


Tanyard at HWY 21


Tanyard at Mobile Park

Fig. 2.4.57-2.4.59 Tanyard Branch Infrastructure Images

Walther's Park

At Walther's Park there are 70 at risk structures inclusive of 8 commercial structures, 9 park structures, and 53 residential structures. Also at risk is Veterans Dr. which is a critical north south connector and emergency access route to this area, and Walther's Park which is a family destination for the City. This area is primarily served by open drains which are typically at the edges of residential properties along veterans drive and release into one of two channels under Veterans Dr. and into Walther's Park. Since the Park is so low and near the creek once flood level 8' is reached the stormwater system is easily overwhelmed and backs ups causing increased flooding to residences adjacent to the park increasing risk to the residents living there.

Fig. 2.4.61-2.4.63 Walther's Park Infrastructure Images

Fig. 2.4.60 Tanyard Branch Infrastructure Map

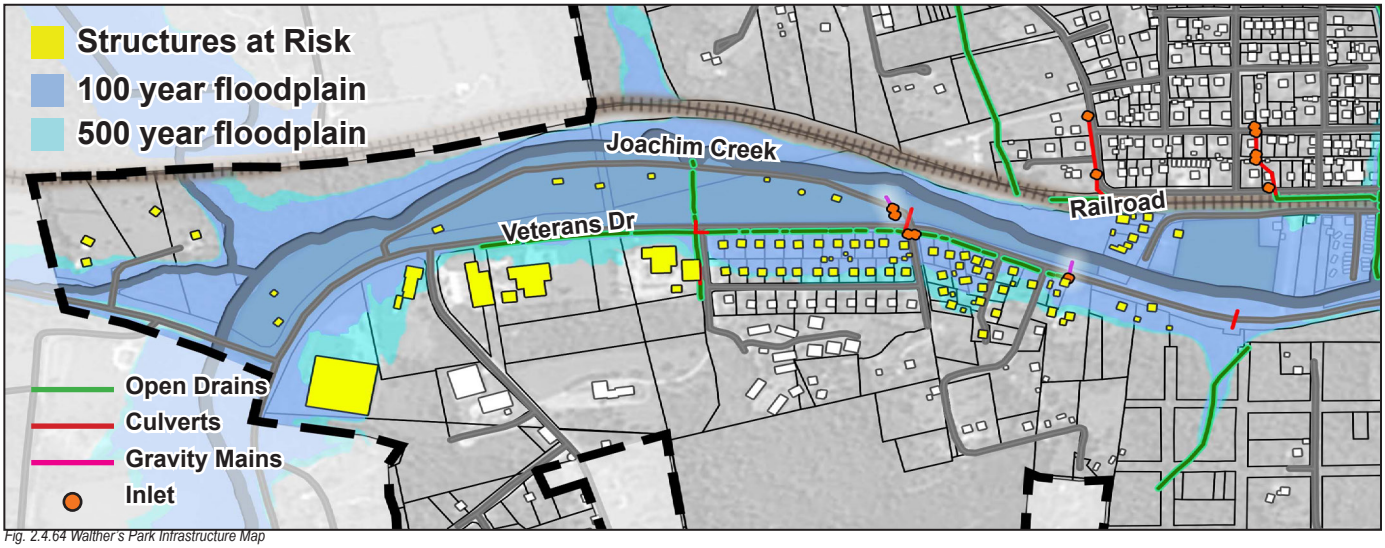


Fig. 2.4.64 Walther's Park Infrastructure Map

Fig. 2.4.65 Walther's Park and Joachim Creek Images

Economy at Risk

There exists an increased risk to loss of or damage to property more frequently from localized flooding that would impact low income residents severely. Fiscally, Main Street is at increased risk of stormwater localized flooding which could impact business operations and visitorship in the corridor. Long term, businesses have expressed wanting to leave the area to avoid the adverse effects of flooding with little to no desire to stay in De Soto if the flood problem continuous bringing down the value of Main St. The Union Pacific railroad also faces several impacts in operations and work force access that would present economic hardships to the business and city.

Overall Vulnerability to Stormwater Localized Flooding

Vulnerability: ***Moderate***

Localized Flooding impacts affects specified areas of the City of De Soto and their consistently working to improve those conditions year after year breaking ground on the Valley Storm water project this year (2023) to correct the risks to that area. Risk and vulnerability of this issue is expected to decrease as the City continues repairing mains and lines. Until then there continues to be a likely probability of this event continuing to affect area businesses and neighborhoods with a decreasing extent and overall impact overtime.

Hazard: Creek Bank Erosion

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Creek Bank Erosion	Likely	Minor	Small	> 24 hours	> 1 week	2.1	MODERATE

De Soto's erosion risk arises from the nature of the flash flood impacts which move very quickly and can carry large volumes of water. Past studies have also indicated that the land that De Soto is founded on particularly along the Joachim Creek inclusive of Main St. De Soto and Walther's park is highly susceptible to erosion. At one point when Veterans Drive was elevated in De Soto, Missouri Department of Transportation dropped large stones on the banks of the Creek to stabilize the condition of the land.

De Soto has a high erodibility factor for areas along the creek corridor which are at an already increased risk to other hazards.

Areas at Risk

Erosion poses significant risk to structures and people settled near the edges of the banks of the Joachim and major tributary creek corridors. Already, at Valley place it has been observed how long term erosion due to flooding caused a home to collapse. The same risks exist along other creek and tributary corridors but the highest risk of tributaries with the highest flows and greatest level of impact to infrastructure and life safety are along the Joachim Creek, Tanyard Branch, and County Tributary.

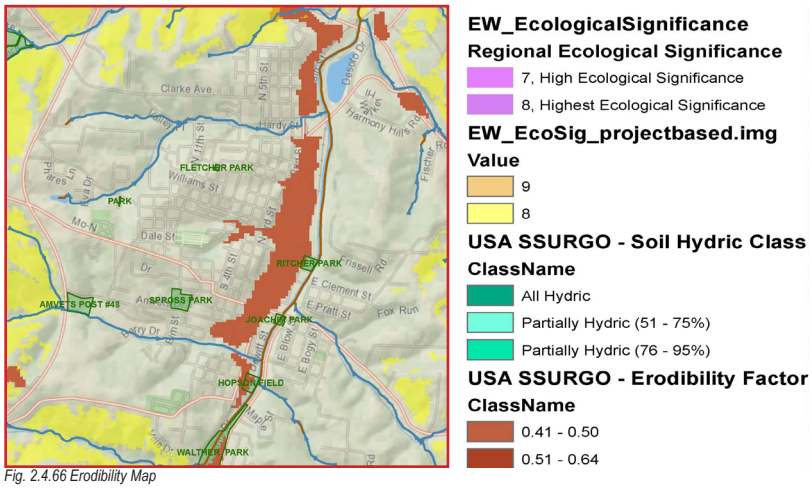


Fig. 2.4.66 Erodibility Map

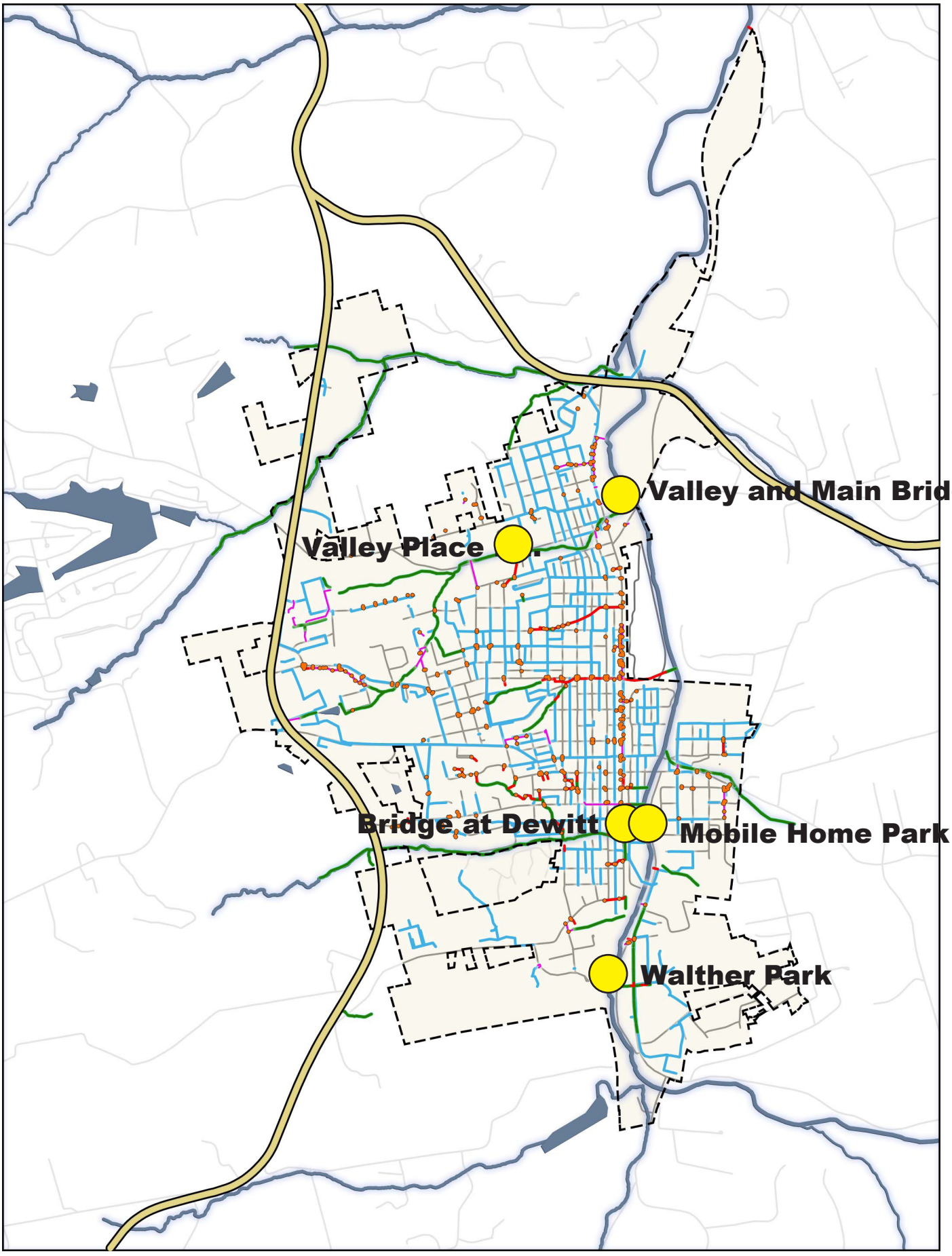


Fig. 2.4.67 Areas at Risk by Erosion

Infrastructure at Risk

Erosion has been seen occurring along the banks of major waterways in De Soto. Notable infrastructure at risk that De Soto will need to maintain close observation of includes:

- ***Walther Park:*** The Creek Banks are slowly eroding away specifically around the existing parking lot and perimeter road that could cause a collapse.
- ***Valley Place:*** The tributary runs directly along the street at this point and significant erosion can be seen under the road surface and is in danger of collapsing.
- ***Bridge at Valley and Main:*** The bridge was filled in with concrete but still shows signs of cracking that must be addressed given the importance of the channel to allow water discharge.
- ***Mobile Home Park***: The banks of the mobile park sit at the edge of the outfall point for the Tanyard branch. When major flood comes through they rip away at the land at immense speeds. A few of those mobile homes now only sit several inches away from falling into the branch bed.
- ***Bridge at Dewitt and Tanyard***: This bridge is low to the flow of the Tanyard and exhibits signs of cracking.

Economy at Risk

The greatest economic risk of erosion to De Soto is that a collapse of a bank or tributary wall would require significant capital for infrastructural repairs. Main Street on the other hand would mean the loss of businesses which could impact De Soto's overall revenue generated.

Overall Vulnerability to Creek Bank Erosion

Vulnerability***: Low***

Not many people would be directly impacted by erosion in De Soto. Likewise, the City takes careful observation of structures and could/would conduct the necessary repairs in a timely manner. The probability of erosion continuing to occur is likely with every flood event anticipated to occur but will continue to have minimal impact over time on critical infrastructure or personal property/ resident life.

Fig. 2.4.68 Valley Place Flooding

Fig. 2.4.69 Valley Place Dry and Eroded Road

Fig. 2.4.70 Erosion and Cracking at Valley and Main Bridge

Fig. 2.4.71 Cracking at Valley and Main Bridge

Fig. 2.4.72 Erosion along Tanyard

Fig. 2.4.73 Erosion at Mobile Park

Fig. 2.4.74 Erosion at Storm Drains and Debris Carried

Risk Assessment Conclusions

The following chart is an overview of the risk assessment of the hazards faced by De Soto. The highest priority items for the City to address are Dam/Levee Failure and Flooding at the 100yr/500yr floodplain. The moderate priority items De Soto must address are stormwater backups/localized flooding and creek bank erosions which offer a less significant risk to the city than the others.

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Dam/Levee Failure	Possible	Critical	Large	< 6 hours	< 1 week	3.0	HIGH

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Flood: 100/500 year	Highly Likely	Limited	Moderate	< 6 hours	> 24 hours	3.0	HIGH

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Stormwater backups	Likely	Minor	Small	< 6 hours	< 24 hours	2.2	MODERATE

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Creek Bank Erosion	Likely	Minor	Small	> 24 hours	> 1 week	2.1	MODERATE

Priority Risk Areas

To determine the greatest at risk areas the team stacked the overall analysis of hazards to the 5 key floodable neighborhoods in De Soto to understand where impact and repetitive loss were most apparent in the City. The ranking of the priority area neighborhoods is as follows:

1. Walther's Park: Walther's Park neighborhoods are most at risk in De Soto. Residents are older with less capacity for mobility. The area can easily be cut off from emergency services when the Joachim Creek floods limiting response capacity. Its lower elevation to the creek means the park and homes are some of the first places in the City to flood. Bank erosion along the park puts critical infrastructure at danger including Veterans Dr, the key access route to the area and most dangerous road in the City when flooding is occurring. When flooding is expected these residents and this area are most vulnerable to the consequences. Residents here should be tended to immediately and a plan should be in place to stabilize the conditions and impact in the area.

2. East of Main: East of Main is the second most at risk area. Although East of main has significantly more at risk structures than Walther's Park, the East of Main corridor takes longer to flood than the Walther's Park area and has more opportunity of access to receive needed emergency services for people to evacuate.

3. Tanyard Branch: The Tanyard branch experiences more localized flooding conditions from backups. These areas will typically only flood once the creek has begun to rise and the capacity for water is met at the outfall. Residents along the Tanyard have a greater opportunity to evacuate before flooding impacts their homes.

4. Main St. De Soto: Main St. does not flood often from the Joachim instead it is backup of sewer infrastructure that impacts Main St. People do not live on Main St. so the area can be easily evacuated and monitored before impact occurs. Likewise stormwater infrastructure projects are underway to improve conditions minimizing risk over the long term.

5. Valley Place: Valley place has the least number of at risk structures and there are plans under beginning construction this year to address the flooding concerns and issues at Valley Place.

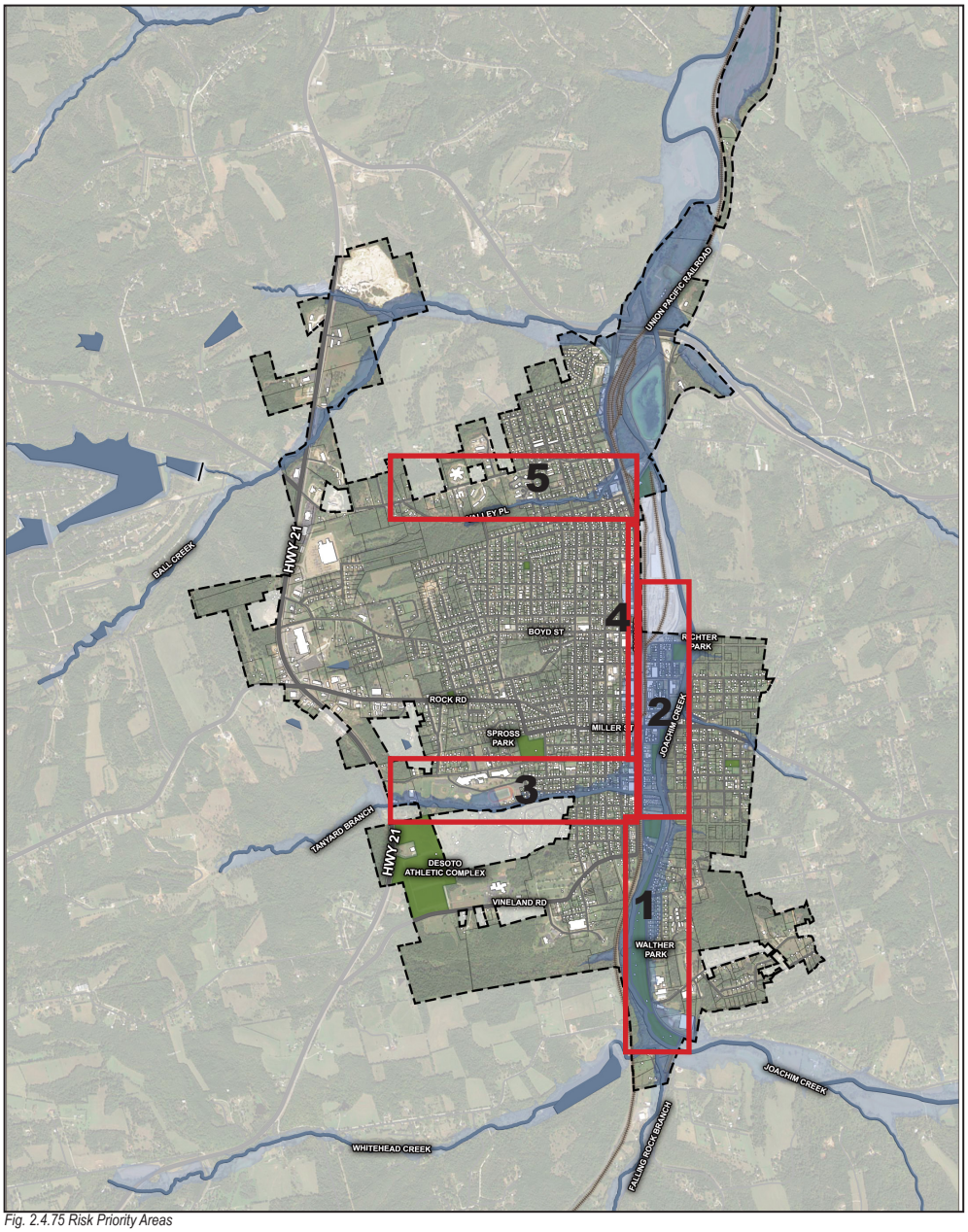


Fig. 2.4.75 Risk Priority Areas

Health and Safety Consequences Analysis

Flood waters may prevent access to areas in need of response or to the critical facilities themselves which may prolong response time. The public must understand that they should never drive through flooded streets. In De Soto, all of the deaths to date due to flooding have been from people who drove through flooded areas or from anxiety and stress induced impacts of flooding. Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed by flood waters.

Floods can severely disrupt normal operations, especially when there is a loss of power. This can affect the operations of critical facilities, which affects response times. Loss of power also puts the public at risk. Downed power lines pose a serious hazard and should always be treated as if they are still energized. When a building loses power during a flood, electricity should be turned off and not used until the wiring can be inspected, to avoid risk of electrocution or fire. Damage to electrical equipment can result from exposure to flood waters contaminated with chemicals, sewage, oil, and other debris.

Certain health hazards are common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm, and industrial chemicals. Pastures and areas where farm animals are kept, or their wastes are stored, can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e.coli and other disease causing agents. Residents with private wells will need to have their water quality tested to ensure it is safe for use.

The second type of health problem arises after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. Flooding can also cause extensive mold growth in building walls and floors, which also poses a respiratory health hazard.

The third problem is the long-term psychological impact of having been through a flood and seeing one‘s home damaged and personal belongings destroyed. The cost and labor needed to repair a flood damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Another health risk from flooding comes from animals, such as snakes and rodents, that make their way through floodwaters and come into contact with people. Animals can pose a risk of physical attack and/or spread of disease.

Debris also poses a risk both during and after a flood. During a flood, debris carried by floodwaters can cause physical injury from impact. During the recovery process, people may often need to clear debris out of their properties, but may encounter dangers such as sharp materials or rusty nails that pose a risk of tetanus. People must be aware of these dangers prior to a flood so they understand the risks and take necessary precautions. Several homes in De Soto already suffer from mold and mildew and several residents have passed due to the trauma faced by flooding events in the city especially since so many are at a vulnerable age.

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CITY HALL
17 BOYD

2.5

CAPABILITY ASSESSMENT

Capability Overview

The City of De Soto is the primary authority over this planning process and designated to implement the actions recommended throughout this planning process. The City has a Council-Manager form of government where city manager oversees day to day operations and a city council heads policy and regulatory ordinances for the overall well-being of the City. If opted to do so the City Council would hold the necessary hearings and informational meetings to officially adopt the Hazard Mitigation Plan and make it an official policy binding document of the City. To date while several studies and plans have been developed addressing flooding none are officially adopted by the city. Council members serve a term of three years and the mayor is selected by the council from the council members elected to office. The City officers inclusive of the City Manager, City Attorney, City Clerk, and Finance Clerk are elected into office. In the case of De Soto The City Manager is also the Flood Plain Administrator and is the lead on the development and implementation of this hazard mitigation plan.

Capacity Index

The Headwater Economics Rural Capacity Index indicates De Soto is a medium capacity community with a value of 57. This means that 52% of communities nationwide have a greater capacity of resources inclusive of local government staffing, community education & engagement, and socioeconomic trends, indicating that De Soto has a greater need of resource assistance than other areas of the country in terms of :

- Staffing capacity
- Expertise
- Resources
- Tax Base

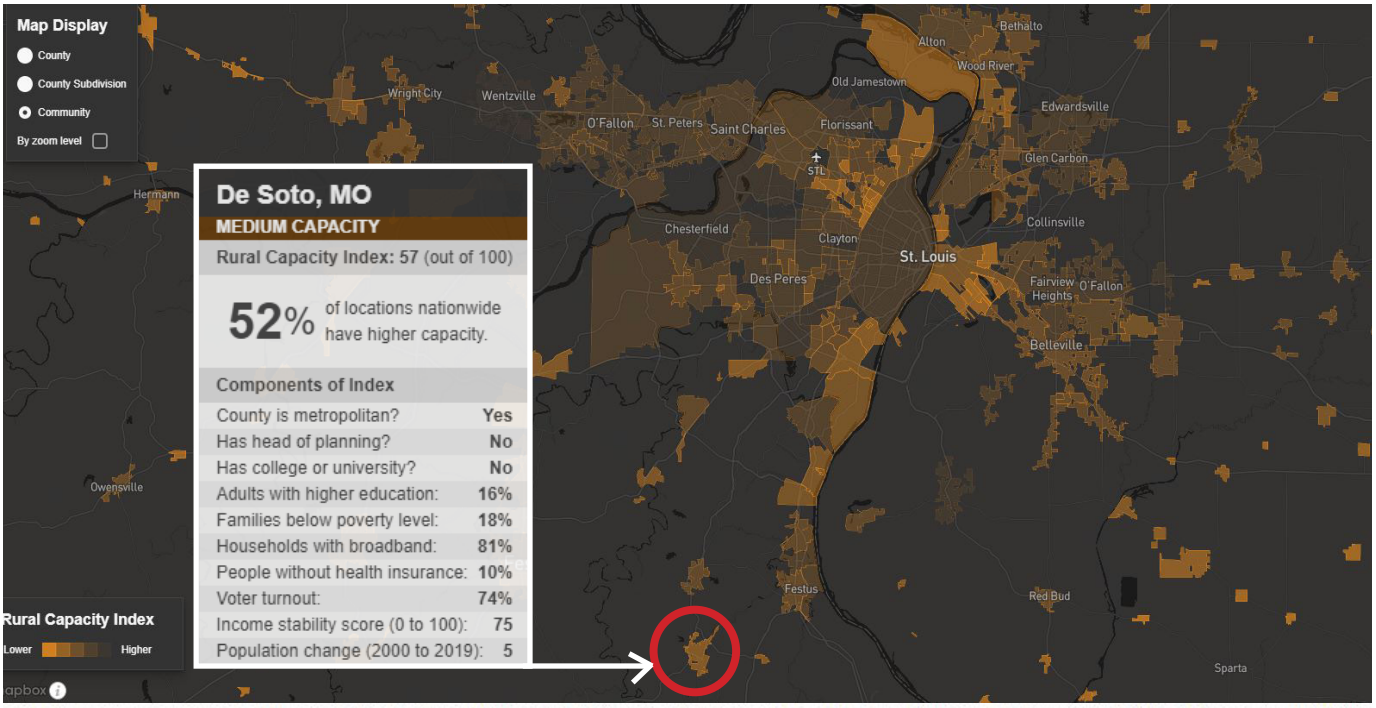
According to Headwaters Economics communities that lack capacity are often where the greatest need for outside investment is located. The capacity index tool demonstrated below can assist the City in advocating for additional resources and tools for implementation so that De Soto receives its fair share of federal, state, and regional assistance. Using the capacity index communities can be supported through initiatives to:

- Provide Direct Funding
- Improve Access to Competitive Grants
- Fund Technical Assistance
- Increase Funding for Multi-Jurisdictional Projects
- Address Root Problems

Regulatory Mitigation Capabilities

The following table lists regulatory mitigation capabilities typically used by jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of De Soto.

De Soto has several regulatory tools at their disposal for Flood Mitigation purposes. Most



Data Sources: Headwaters Economics' Rural Capacity Index; First Street Foundation's Flood Factor; USDA Forest Service's Wildfire Risk to Communities.

Fig 2.5.1 Capacity Index Map. Headwater Economics

Regulatory Tool (Ordinance, codes, plans)	In Place? (Y/N)	Comments
Comprehensive Plan	No	Indicated through discussion that the last plan was done decades ago and is not up to date
Zoning Ordinance	Yes	
Subdivision Ordinance	Yes	
Floodplain Ordinance	Yes	
Stormwater Ordinance	Yes	
Erosion, Sedimentation, and Pollution Control Ordinance	Yes	
Building Code	Yes	
BCEGS Rating	No	
Stormwater Management Program	No	While a specific plan is not developed the city has measures for stormwater, waste water, and flood plain management built into city code.
Site Plan Review Requirements	Yes	
Capital Improvements Plan	No	While a specific plan is not developed the City does outline improvement projects on the website inclusive of infrastructure.
Economic Development Plan	No	
Local Emergency Operations Plan	Yes	Emergency Action & Evacuation Plan
Flood Insurance Studies or Other Engineering Studies for Streams	Yes	USGS Hydraulic Study, USACE Joachim Creek Management Plan, APA Downtown Resiliency Plan
Repetitive Loss Area Analysis	Yes	City has indicated that previous administration did not properly upkeep these records. Repetitive loss is therefore innacurate.
Elevation Certificates	Yes	Required to be filed for any property built on floodplain.

Fig 2.5.2 Regulatory Capabilities Mitigation Table

important are their existing stormwater and floodplain ordinance to guard against increased runoff into the Joachim Creek

Though the City has a strict set of regulations for this already, the team has recommended that the regulations be updated to account for increased precipitation and to overdesign for a 0 gain on the creek levels (see recommendations in Ch 2.6 mitigation strategy and action plan).

Administrative/Technical Mitigation Capabilities

The following table identifies relevant resources and responsible departments for flood mitigation resources and information.

Resource	In Place? (Y/N)	Responsible Department	Comments
Grant Writer	N	N/A	Buy-In Community Planning and the Citizens Committee for Flood Relief have been working with the City on this effort since 2020.
Flood Plain Administrator	Y	City Manager	
Emergency Manager	N	N/A	The City Emergency Action and Evacuation Plan outlines and delegates emergency management to a team of city and community leaders with the City Manager as the lead point of contact.
Stream Gage	Y	City Manager	City takes on all costs and maintenance.
Warning Systems	Y	City Manager/Polic/Fire	City manager provides code red alert notice, police and fire door knocking.
GIS - Building Footprints	Y	Public Works	
GIS - Street Centerlines	Y	Public Works	
GIS - Stormwater Infrastructure	Y	Public Works	
GIS - Floodplain Mapping Data	Y	Public Works	
GIS - Waterways	Y	Public Works	
GIS - Dams	Y	Public Works	
GIS - Key Infrastructure	Y	Public Works	

Fig 2.5.3 Administrative / Technical Capabilities Table

Fiscal Mitigation Capabilities

The following table identifies financial resources available to the city of the purpose of flood mitigation activities.

Resource	Accessible	Comments
Community Development Block Grants	Y	Jefferson County CDBG currently assists the city in the updates to stormwater infrastructure.
Parks and Storm Water Tax	Y	
Capital Improvements Project Funding	Y	
Authority to levy taxes	Y	

Fig 2.5.4 Fiscal Mitigation Capabilities Table

Jefferson County Capability and Capacity Index

Given the potential recommendation for continued partnerships and collaboration with Jefferson county the following capacity index from Headwater Economics indicates Jefferson county capacity to assist. Jefferson County, MO is classified as a high capacity community with only 13% of nationwide counties having higher resources available to them. There is a capacity for Jefferson County to assist further in these efforts.

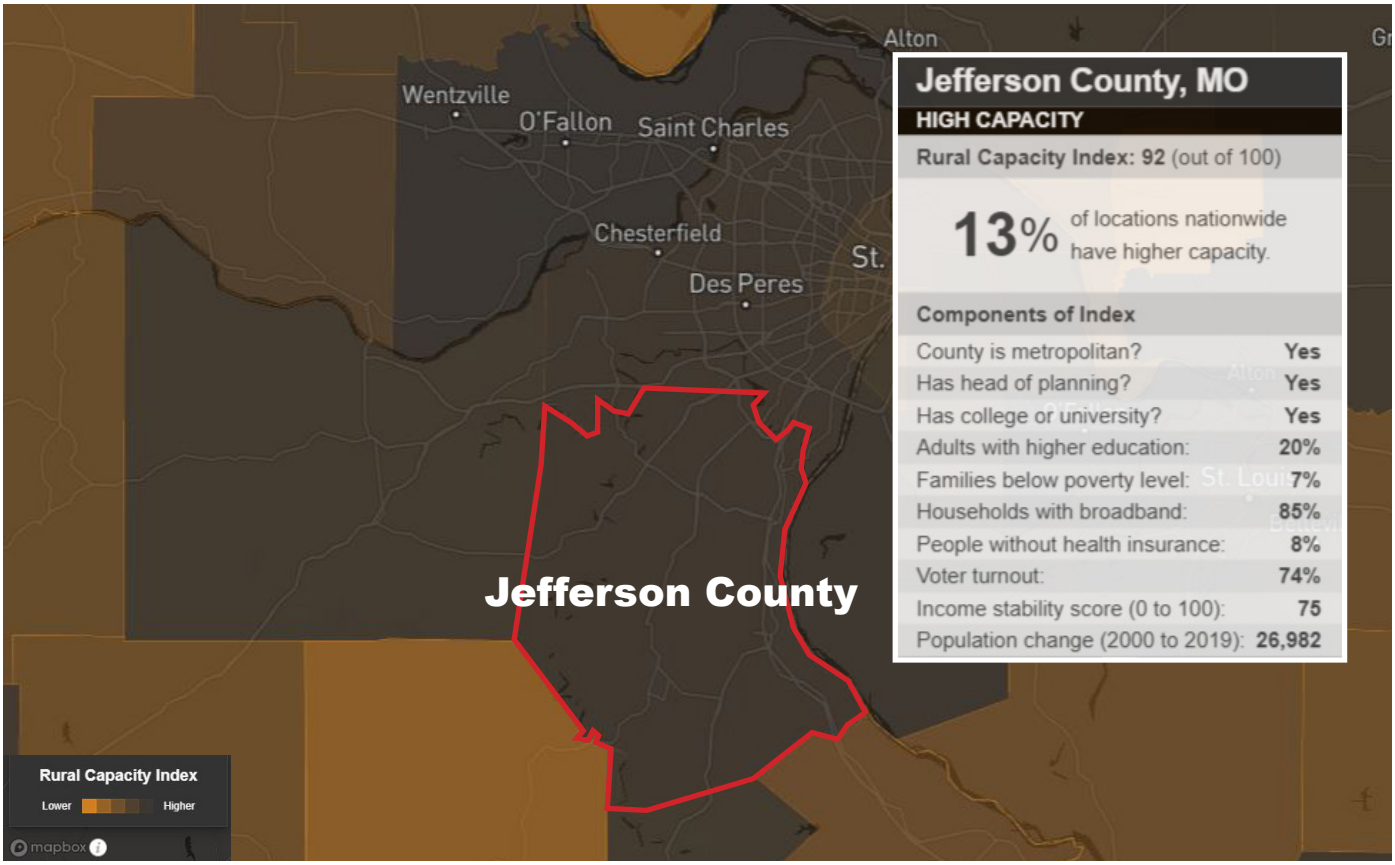


Fig2.5.5 County Capacity Index

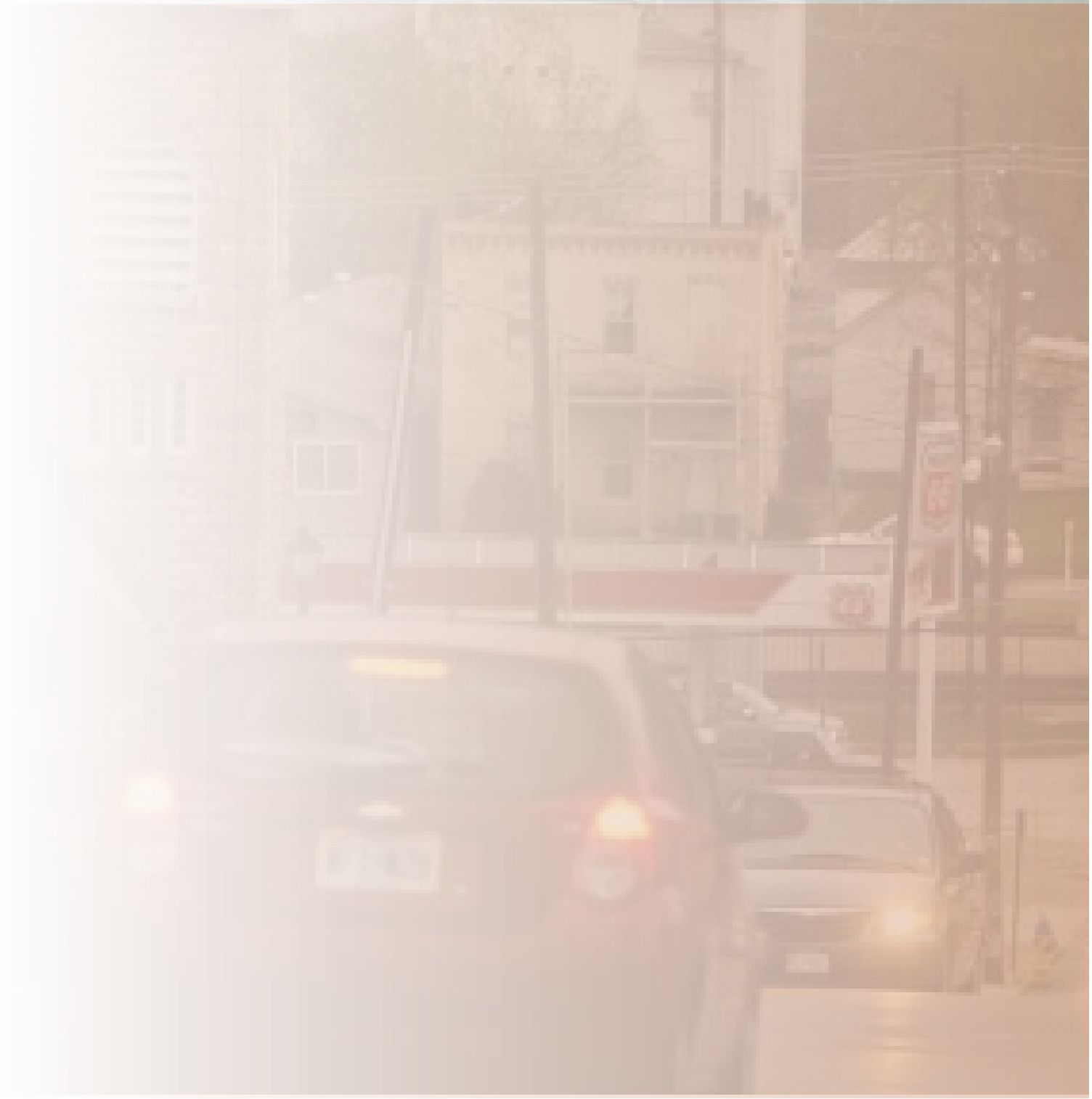
The following is an extract from the St. Louis Regional Hazard Mitigation Plan. It is an identification of county capability for assistance in hazard mitigation:

Jefferson County*

Policies and Programs (e.g. Zoning Ordinance)	Document Reference (e.g. Comprehensive Plan & page number)	Effectiveness for Mitigation (e.g. low, medium, high)**	Rationale for Effectiveness (e.g. low because allows development in floodplain)
Floodplain management	County Floodplain Management Ordinance	High	New construction and improvements are not allowed without extensive mitigation requirements. Any encroachments such as fill, new construction, or other developments within in the floodway must not create any increase in flood levels within the community during a base flood discharge. Requires 2 feet freeboard.
Multi-hazard emergency plan	County Emergency Operations Plan	Medium	Consider more formal mutual aid agreements, improve the Emergency Operations Center, warning systems in rural areas, emergency response equipment, training for volunteer agencies and the private sector, and public preparedness education.
Stormwater regulations	County Stormwater and Subdivision Regulations	Medium	Stormwater runoff, sediment and erosion management provides effective measures to deal with increasing development trends.
Building regulations	County IBC 2015	Medium	The county has building inspectors that ensure construction is built to code.
Flood insurance	Joined NFIP 5/16/83 #290808	High	The county administers and participates fully in the NFIP.
Mississippi River levee issues	Levee districts	Medium	Coordination with county jurisdictions through USACE.

*No changes were made from previous plan update except for updating year of most recent building code.
** High – Policy and Program in place and in use
Medium – Policy and Program in place but needs refinement, increased involvement
Low – Policy and Program in place but elements work against mitigation

Fig 2.5.6 County Capability Assessment



2.6

MITIGATION STRATEGY & IMPLEMENTATION PLAN

Mitigation Strategy

The results of the planning process, the risk assessment, the goal setting, and the identification of mitigation actions led to the mitigation strategy and mitigation action plan for this Flood Resiliency Plan. From the onset of the project the planning team understood that the issues facing De Soto and intensifying the problems were not De Soto's alone and that there was not a single solution that would fix the rapidly intensifying flooding conditions overnight. The approach to the mitigation and action plan is therefore rooted in the understanding that to mitigate flooding it will take a series of small scale interventions, strategically placed to reduce the risk to the communities. Based on this understanding the direction of the plan followed for basic assumptions as a baseline to the goals, objectives, and mitigation actions.

Planning Assumptions

The plan accepts for planning assumptions which act as premises to the development of the mitigation strategy goals, objectives, and action items. These planning assumptions were developed by looking into the history of the community, through internal team discussions, and from community and stakeholder feedback. The assumptions are as follows:

Living with Water

Living with Water builds on the geographic and hydrological history of De Soto understanding that the Joachim Creek is a critical part of De Soto and its foundation. Once known as fountain city due to its expansive network of artesian wells, De Soto is intertwined with the history of water and should continue to make water and the Joachim Creek a key component of its overall identity. The creek will always be there and the City of De Soto and residents must plan for its changing condition over time. There are five points to Living with Water:

1. The City of De Soto is a river town with a deep history of underground springs and intermittent flooding from the Joachim Creek.

2. Extreme weather events leading to the Upper Joachim Creek flash-flooding within the downtown area of the City of De Soto will overtime gradually amplify in intensity and frequency.

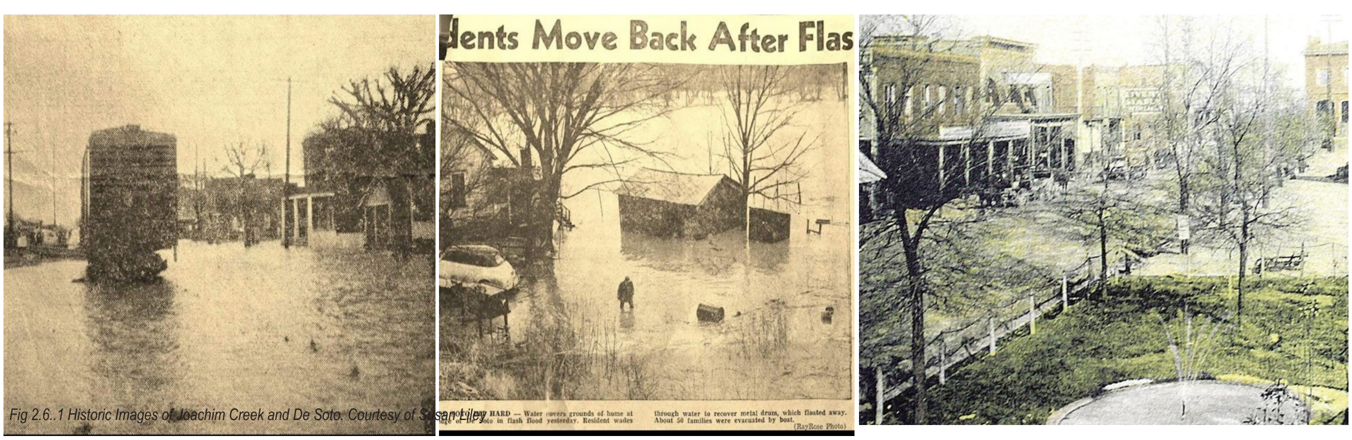


Fig 2.6..1 Historic Images of Joachim Creek and De Soto. Courtesy of Susan Liley

3. The exact nature of this amplified extreme weather increases is uncertain and unpredictable, however the risk to life and property is anticipated to increase over time.

4. There are significant flash-flood dangers from under-performing dams up-stream of the City of De Soto.

5. It is not feasible to retain sufficient of the Upper Joachim Creek flood waters within the watershed south of the City of De Soto such that no flooding will occur in downtown.

There is a rich history of water in De Soto. Many of the residents and stakeholders interviewed claim that De Soto used to never flood. Past news reports demonstrate otherwise, indicating that the history of flooding and the history of De Soto have always been intertwined. What residents mean to say and what the planning process research indicated is that while De Soto is used to flooding in the course of its history it is now flooding more intensely and more frequently than in the past.

Nature-Based Solutions

Current research trends and best mitigation practice recommendations indicate the importance of natural solutions to flood problems across the country. Many communities facing similar issues to the city of De Soto are slowly reclaiming their waterways and expanding their green networks to leave *"Room for the River", meaning areas that the river, or in this case Joachim Creek , can comfortably flood without posing severe damage or flood risks to life or property.* Beyond flood able areas, communities are turning the open flood-able space into community amenity/ destination sites. These site flood when needed but when no flooding is occurring the become open and usable green space for the community. De Soto should embrace the river, give it the necessary area, and support a key community and amenity facility for all. There are three points to Nature Based Solutions:

1. There is a need to increase the "Room for the River" and create additional flood-able parks.

2. There is a need to locally reduce the inflow of urban stormwater into the Joachim Creek in times of flood and stop the flood waters backing up through the sewer and stormwater system.

3. There is a need to increase nature-based flood retention and absorption areas throughout the Upper Joachim Watershed.

In 2021, the H3 Studio team developed three options for nature based resiliency strategies along the Joachim Creek. Though the presented options targeted different amounts of intervention they each recommended "Leaving Room for the River" as the planning assumption suggests. Achieving any vision of these strategies will require considerable property acquisition, which the city is already conducting, and re-mediating the land into flood-able open park spaces with bioswales, native plantings, and other green infrastructures to mitigate the flow of water in and out of the creek.

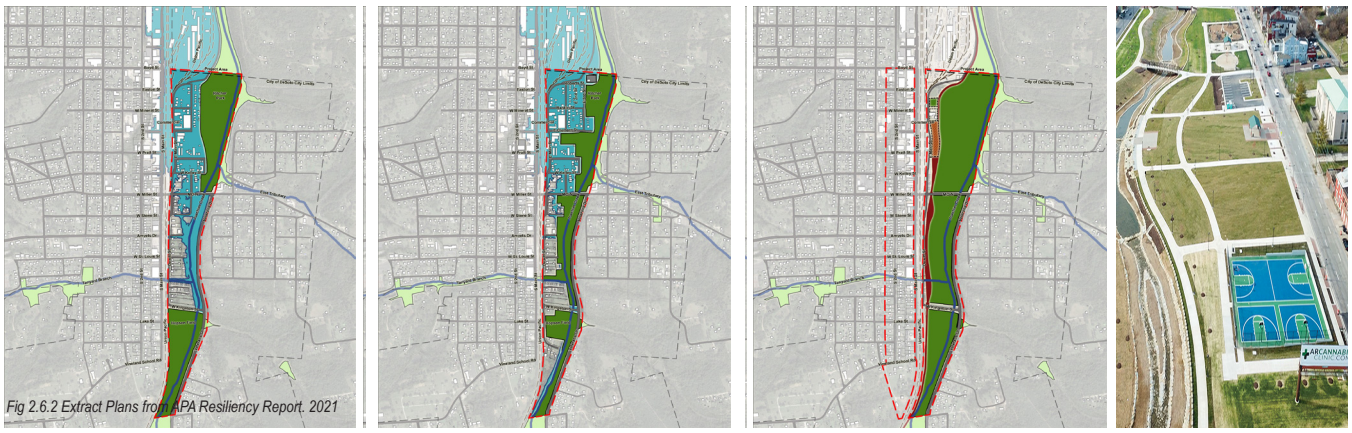


Fig 2.6.2 Extract Plans from APA Resiliency Report. 2021

Improving the Quality of Life

The key purpose of this plan is to improve the quality of life for De Soto residents as a whole. This means that the plan not only works to reduce the risk to life of residents in the floodplains of the city but also to ensure quality growth and development that improves the livelihood, amenities, and economic promise of the community. The action items must consider that in order to implement an effective mitigation strategy a strong social and economic base must be formed. There are four points to improving quality of life:

1. It is essential to increase public safety from flooding as well as providing transparent oversight of redevelopment post-flood conditions.

2. There is a need to retain and grow the economic base of downtown and adjacent businesses as well as protecting key infrastructures.

3. All new development in the Upper Joachim Watershed should provide increased storm-water retention to ensure no water discharge in times of flood.

4. The residents of the neighborhoods adjacent to the Joachim Creek have expressed a desire to remain within the City of De Soto.

Improving the quality of life for the City as a whole is critically towards finding more available tax dollars and city resources for overall mitigation strategies. For many of the mitigation action items it is important for he city of De Soto to look beyond the step being taken at the long term result. For example, buyouts have been a source of controversy in the city where many community members feel less comfortable in the city using tax payer dollars to fund private property acquisitions in the floodway. However, community members would be more receptive if informed that the ultimate goal of these acquisitions would be family friendly and accessible amenities like expanded trails and park space in De Soto.

Partnerships for Implementation

With over 65% of the watershed draining into the Joachim Creek and over 15 unregulated dams in county land upstream of the city several of the challenges facing De Soto will require multi-jurisdictional and multi-disciplinary approaches to address areas out of the city's jurisdiction. It is critical that De Soto begin establishing the necessary partnerships for implementation with county officials, private land owners, and non-profits almost immediately as some of these relationships may take years to solidify to the point needed for significant impact. These partnerships are also critical towards acquiring funding. There are two points to partnerships for implementation:

1. There is a need for a heightened multi-jurisdictional community-based emergency prediction, notification and response system as well as forward-looking adaptation and mitigation planning.

2. Implementation always requires matching local funds to access state, federal and philanthropic funding.

Already in De Soto there exist several non-profit, county, state, and national organizations working to improve life safety and assist De Soto in combating its flood problem. The City must continue to foster these relationships and involve interested parties in the development and implementation of future mitigation actions pertinent to the missions and capacity of these organizations.

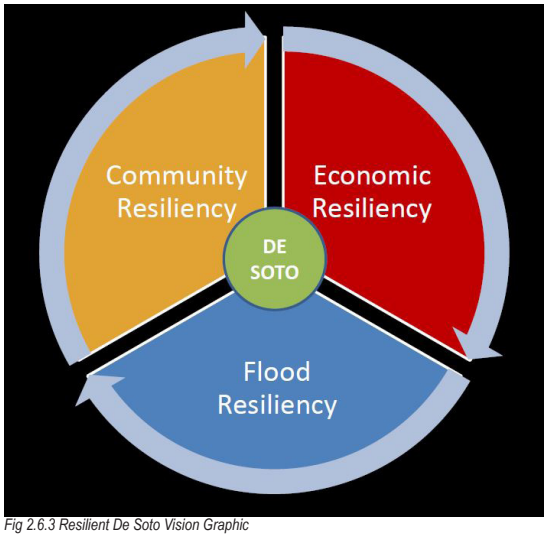


Fig 2.6.3 Resilient De Soto Vision Graphic

Vision: Resilient De Soto

The vision of a Resilient De Soto is established on the notion that for De Soto to achieve the Resiliency goals and initiatives necessary, the plan must be based on a multi-disciplinary approach that seeks to make the city socially, economically, and flood resilient. The are three premises to the De Soto vision:

- ***De Soto needs a balanced holistic approach to flood resiliency, economic resiliency, and social/ community resiliency.***

- ***Flood resilience initiatives need to improve the overall quality-of-life for all residents and create a safer community for those at risk.***

- ***The at-large community influences the tax base, projects, and economic gain in the city, and a strong diverse economic foundation is necessary to develop resiliency and mitigation projects and efforts.***

Goals + Objectives + Action Items

Since De Soto did not already have a flood resiliency plan at the time of this planning process there were no previous goals to review or assess for relevance or updates in this plan. What De Soto does have is five distinct area specific planning efforts that set a baseline for discussion and the pre-liminary goals of the plan. Each of these studies and plans indicated some form of action items, goals, and recommendations for the City of De Soto. While they had relevant recommendations for the city the documents and plans did not look at their planning efforts holistically in the way the resiliency plan outlines.

The following represent the goals of the De Soto Flood Resiliency Plan which have been derived from public engagement and analysis of the overall needs and capacity of the City. Each goal has a series of objectives to help meet it, and each objective a series of strategies that would contribute to its success.

De Soto Resiliency Goals

1.0: Community Livability + Development

In conjunction with increasing flood resiliency improve the quality-of-life and public amenities in the historic downtown and neighborhoods adjacent to the Joachim Creek.

2.0: Emergency Readiness + Response

Protect the health, safety, and welfare of residents and businesses in all flood situations.

3.0: Education + Engagement

Implement a city-wide education program to increase awareness of the flooding issues in De Soto and a more informed, pro-active and engaged community.

4.0: Watershed Stewardship + Ecosystem Services Health

Actively cooperate with, city, county, and state leadership to maintain the condition of and promote best mitigation and development practices within the Joachim Creek and Upper Joachim Watershed.

5.0: City-Wide Essential Services + Green and Blue Infrastructure

Actively cooperate with, city, county, and state leadership to maintain the condition of and promote best mitigation and development practices within the Joachim Creek and Upper Joachim Watershed.

6.0: Public Policy + Regulations

Build a transparent system of accountability by codifying and enforcing mitigation best practices and development regulations that reduce stormwater and runoff impacts in the Upper Joachim Watershed.

7.0: Risk Management Partnerships + Funding

Effectively utilize existing resources and expand sources of revenue to finance critical flood mitigation projects while improving the overall fiscal resiliency of the city.

GOAL 1: Community Livability + Development

In conjunction with increasing flood resiliency improve the quality-of-life and public amenities in the historic downtown and neighborhoods adjacent to the Joachim Creek.

Objective 1: Create new flood detention opportunities and expand the floodable park area adjacent to Joachim Creek and tributaries.

1.1 Facilitate an on-going voluntary property acquisition (buy-out) program in areas of high-flood probability and conversion to floodable park space.

1.2 Incrementally expand the opportunity for an integrated system of floodable parks and open space along the Joachim Creek and tributaries to create an expanded Joachim Parks and Trail system.

1.3 Create an expansive Joachim Parks and Trail system for walking, jogging, and bicycle riding.

1.4 Encourage the pedestrian and bicycle linkage of Main St. as well as existing and future open space areas throughout the city to the Joachim Park and Trail system.

1.5 Re-configure Walther Park, Richter Park, Shoe Factory site and Hopson Field into floodable park spaces following floodable park best practices that are still usable as recreational amenities when no flooding is occurring.

Objective 2: *Strengthen and revitalize the historic downtown and program the emerging park space as major community assets and defining features of De Soto.*

2.1 Develop a toolkit of diverse housing types and construction techniques that increase the range of affordability and are incorporated into the city's land-use plan and zoning code.

2.2 Create a land use and property ownership inventory of possible development locations for a diverse range of affordable housing types.

2.3 Facilitate the acquisition of land for the purpose of affordable housing developments.

2.4 Develop a "land swap" program to facilitate relocation out of the flood way.

Objective 3: *Promote the development of affordable housing and choice neighborhood development throughout the city in areas that do not flood.*

3.1 Work to register the De Soto Main Street and its relevant buildings into the National Register of Historic Places.

3.2 Increase the protection of Main Street through back-flow preventors, culvert gates, etc. and investigate the opportunity for a minor levee or berm adjacent to the rail line.

3.3 Create an effective Main Street organization that coordinates activities, events, and business support along Main Street while increasing Main Street's influence within the city and its economic structure.

3.4 Create a strategic plan for Main Street economic development that also includes "Main Street First" policies to limit relocation to other commercial corridors.

3.5 Offer incentives to entice businesses and restaurants to remain on Main Street and improve the aesthetics and functionality of their buildings.

3.6 Encourage the East of the tracks Main Street business to relocate their store fronts onto Main St. where they are safer and more accessible to community foot traffic.

3.7 Develop incubator business spaces along main street to act as startup opportunities for small businesses.

3.8 Continue advocating for the installment of an Amtrak rail stop in De Soto.

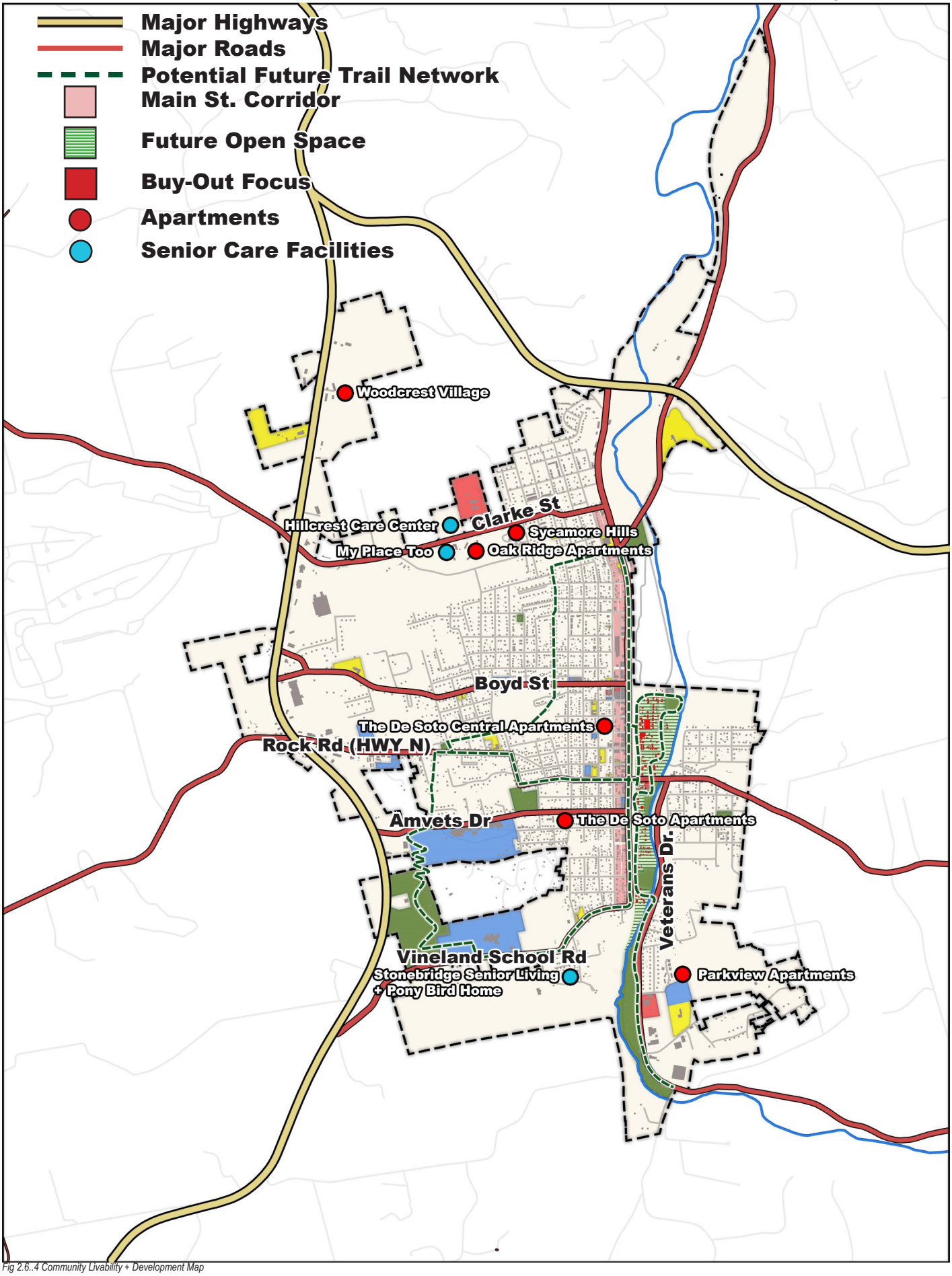


Fig 2.6..4 Community Livability + Development Map

GOAL 2: Emergency Readiness + Response

Protect the health, safety, and welfare of residents and businesses in all flood situations.

Objective 1: Strengthen the City and County's critical service and resiliency infrastructure including the response coordination and capacity of police, fire, and medical support during flood conditions.

1.1 Continue coordination with USGS, SEMA, and the county to provide early warning systems such as gage activated flood lights on dangerous roads and a public alert warning system/flood siren.

1.2 Request that the National Weather Service Advanced Hydrologic Prediction Service (AHPS-River Forecast Center) lower the "action stage" for the Joachim Creek gage from 8 feet down to 6 feet, or as low as feasible.

1.3 Sponsor a combined resource facility for City's and County's departments to pool resources to be used as needed in times of emergency.

1.4 Actively work to recruit personnel for fire and police inclusive of volunteer service men and women.

1.5 Conduct regular inventories of flood fighting equipment, resources, and materials in order to work toward investing and increasing the amount of rescue resources like rescue boats, medical supplies, tactical equipment, etc.

1.6 Lower the action phase level for Code Red from 8ft to 6ft to give residents ample warning of potential flooding effects.

1.7 Work with Jefferson County to relocate the De Soto Rural Fire station out of the floodplain.

1.8 Identify a secondary site for first responders West of the Joachim Creek to allow consistent community access in times of severe flooding.

Objective 2: Provide residents and businesses with the necessary information for their own flood readiness, protection and evacuation.

2.1 Implement a comprehensive signage system for evacuation routes and safe site locations.

2.2 Formalize agreements to use private property for emergency access or as a floodway.

2.3 Educate and assist vulnerable populations in developing personal preparedness plans.

2.4 Support the development of a small-scale clinic/medical facility in De Soto to be used as an emergency location.

2.5 Provide a database of financial resources to dry and wet floodproof or raise homes in the floodplain.

2.6 Test floodway properties for mold and mildew and provide financial support to residents to treat mold as a major public health concern.

2.7 Require mandatory flood disclosures and evacuation information to renters in the Joachim Creek Floodway.

Objective 3: Regularly publish and update the Emergency Action and Evacuation Plan for De Soto and encourage the county to develop a similar plan for The Upper Joachim Watershed.

3.1 Host an annual review/training workshop for all city and county staff and emergency response teams.

3.2 Comprehensively update the Emergency Action and Evacuation Plan every 5 years with a formal public engagement process.

3.3 Ensure the plan to be readily available and accessible to the public in print and web format.

3.4 Study and identify all primary and secondary roadways used by workforce and emergency service providers that flood and develop plans to mitigate flood hazards and prioritize area evacuations.

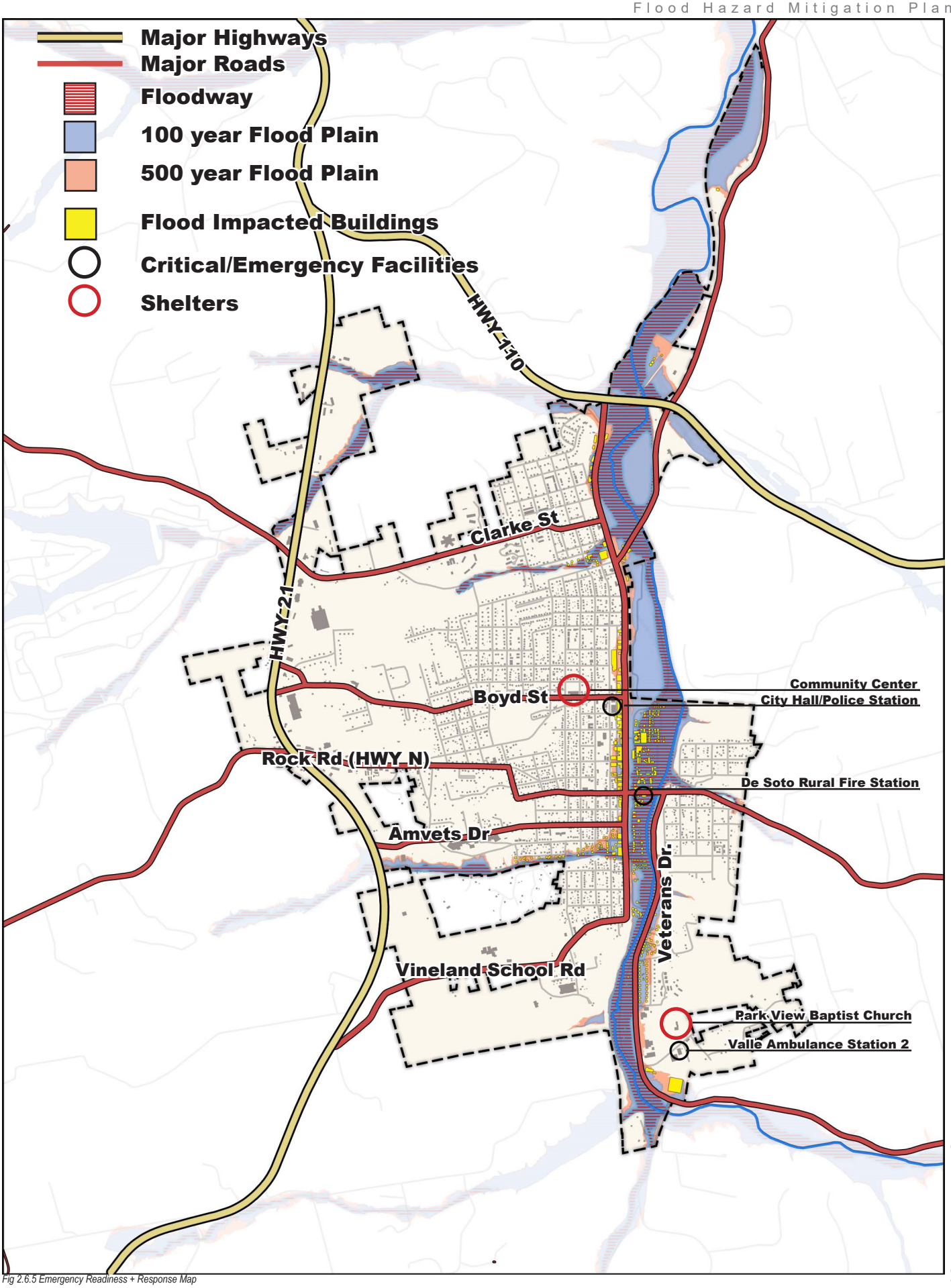


Fig 2.6.5 Emergency Readiness + Response Map

GOAL 3: Education + Engagement

Implement a city-wide education program to increase awareness of the flooding issues in De Soto and a more informed, pro-active and engaged community.

Objective 1: *Develop community wide education, outreach, and advocacy programs to educate the public on the history of flooding, flood plain hazards, prevention, and preparation.*

1.1 Launch a social media and print campaign to raise awareness and bring increased attention to the history of flooding in De Soto and the resultant impacts.

1.2 Periodically survey the public to evaluate if public outreach efforts are effective in identifying potential flood hazards, public concern, and ways to mitigate against hazards.

1.4 Encourage residents to assume an appropriate level of responsibility for their own flood readiness and protection.

1.5 Document availability of flood insurance and nearby insured and uninsured properties to understand burden of costs.

1.6 Develop educational signage in recreational areas that are accessible to the public. This includes historic flood markers, historic impact images, safety and prevention education implemented throughout the city or in a similar way to the tree museum or exercise park that exist at Walther Park.

1.7 Distribute a yearly community brochure updating citizens on the city's progress towards flood resiliency, projects in the pipeline, and opportunities to stay informed and involved.

Objective 2: *Create targeted outreach and public safety programs for floodway residents and create community service opportunities to support floodplain programs.*

2.1 Work with existing FEMA, SEMA, and City resources to develop a "Homeowner's guide to living in a flood plain" which is to be distributed to all flood plain residents detailing their risks, preparation options, warning/ alert systems, and evacuation procedures in times of a flooding emergency. Make it both a web and print resource.

2.2 Lobby for an accessible public record of risks and hazards for properties, development, and overall community awareness.

2.3 Establish a volunteer program with the local school which can count towards A+, NHS, or STUCO service hours which would help impacted residents clean and repair properties post floods and connect local youth with area professional to learn about flood safety, readiness, and sustainability.

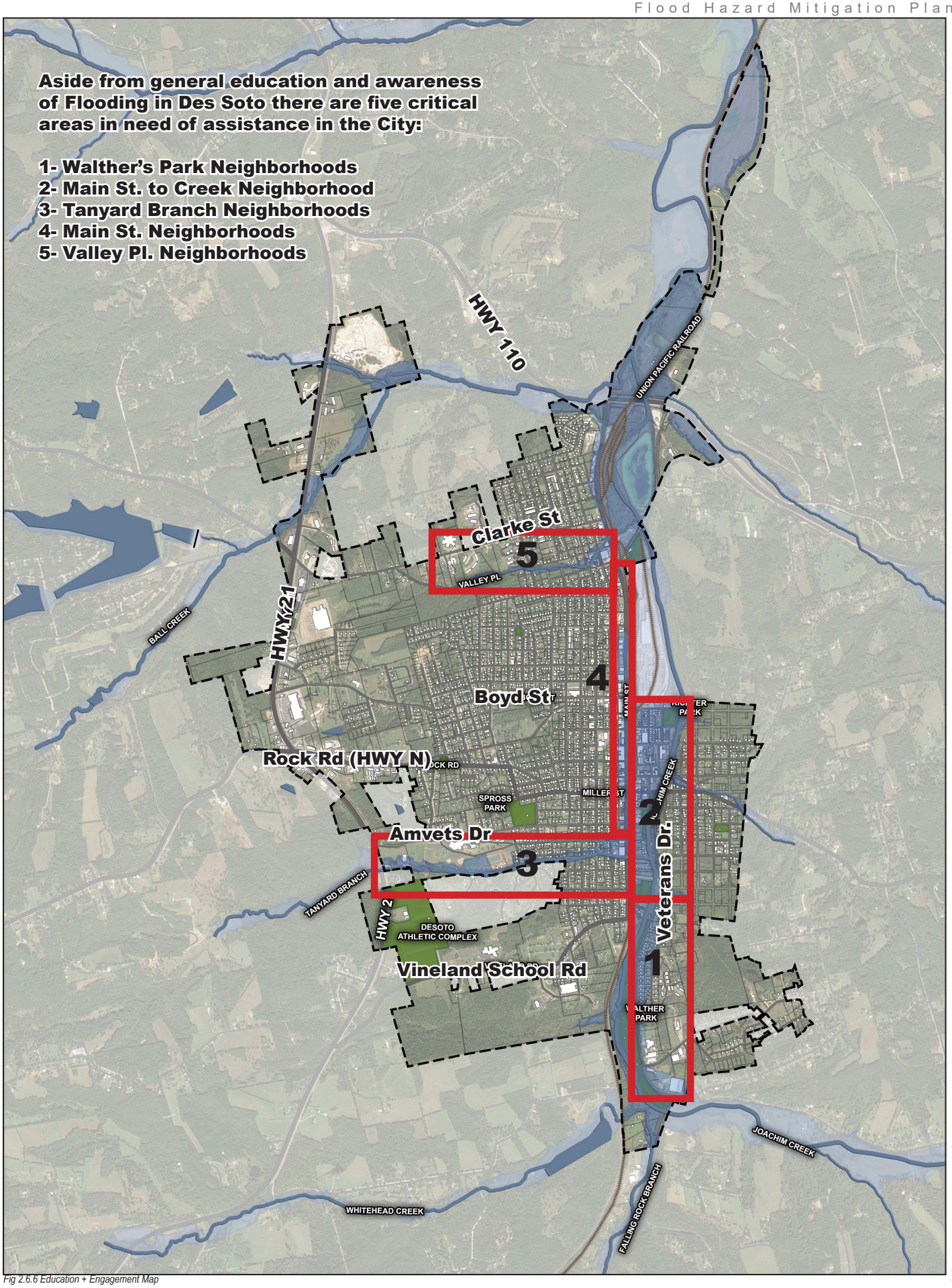


Fig 2.6.6 Education + Engagement Map

GOAL 4: Watershed Stewardship + Ecosystem Services Health

Actively cooperate with, city, county, and state leadership to maintain the condition of and promote best risk management and mitigation and development practices within the Joachim Creek and Upper Joachim Watershed.

Objective 1: *Support basic and applied research toward a specific understanding of the particular existing and future flash flood and underground river system conditions and nature within the Joachim Creek Watershed.*

1.1 *Promote and encourage comprehensive hydrological and meteorological research to understand the causes and trends of flooding in De Soto.*

1.2 *Work with the National Weather Service to identify precipitation and flood patterns in the Joachim Creek watershed specific to amount of rain, direction, and water height.*

1.3 *Promote additional hydraulic studies to explore proposed Joachim Creek watershed management and infrastructure changes to reduce flooding in De Soto.*

1.4 *Conduct a cost benefit analysis to research the feasibility of installing an additional stream gage further upstream on the Joachim Creek.*

1.6 *Create and maintain a database for all hazard events and impacts thereof where data for extent and previous occurrence information is not readily available.*

Objective 2: *Promote and monitor best practices in watershed management throughout the Upper Joachim Creek Watershed to ensure increased public safety and to minimize property flood damage.*

2.1 *Establish a resident and business-based Joachim Creek Watershed Conservancy to stimulate routine meetings, raise funding for projects, and lobby for regulations in the Upper Joachim Creek Watershed.*

2.2 *Establish a Joachim Creek Watershed Management Board to develop and implement regulations and policies to increase flood resiliency and maintain the character and quality of the entire length of Joachim Creek.*

2.3 *Establish a rapid response team to document water elevation levels and survey damage following major floods.*

Objective 3: *Enhance and preserve the natural habitat and ecosystems health and services in the Upper Joachim Creek Watershed.*

3.1 *Where applicable develop wetland, stream, and riparian development corridors for protection and restoration of a naturally flood resilient landscape.*

3.2 *Continue supporting, with the necessary parties (Corps of Engineers, Stream Team, DNR, etc.), the clean up of Joachim Creek to clear up trash and debris from the creek and tributaries.*

3.3 *Create bioswales and green infrastructure along the Joachim Creek corridor that create pollinator and wildlife habitats while reducing localized flooding, and promoting environmental education opportunities for the community.*

3.4 *Continue to test and monitor for lead pollution for floodway properties and take the necessary remedial actions in partnership with the EPA.*

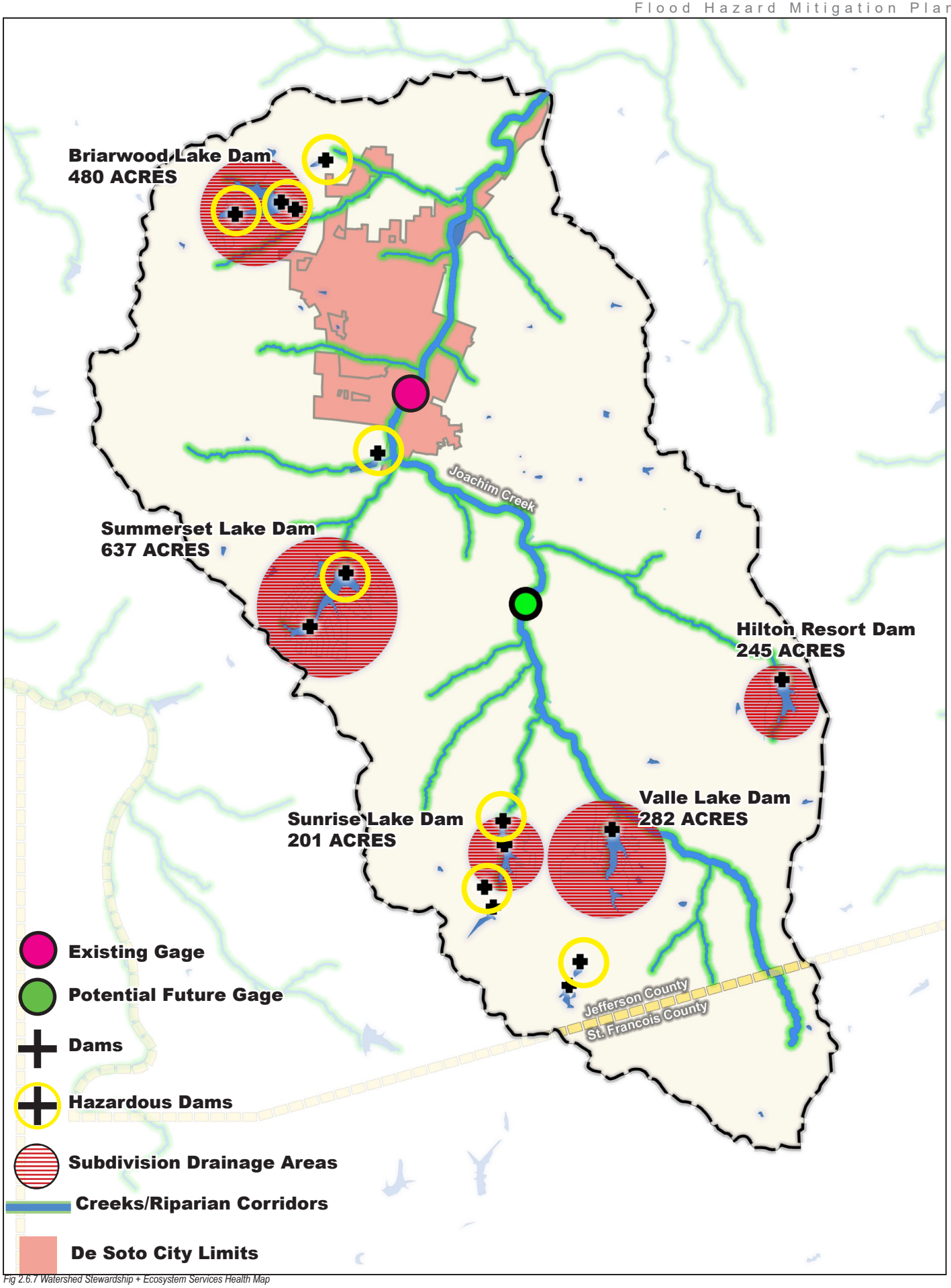


Fig 2.6.7 Watershed Stewardship + Ecosystem Services Health Map

GOAL 5: City Wide Essential Services + Green and Blue Infrastructure

Actively cooperate with, city, county, and state leadership to maintain the condition of and promote best mitigation and development practices within the Joachim Creek and Upper Joachim Watershed.

Objective 1: *Increase the floodable park area and improve the flow of the Joachim Creek through the City of De Soto to improve life-safety measures and reduce the property damage impact of flooding.*

1.1 Target repetitive loss properties for buy outs to implement green infrastructure and mitigation projects in the floodplains.

1.2 Consider the construction of flood walls and levees to protect businesses along Main St.

1.3 Protect transportation routes and improve traffic flow along Veterans Dr. to ensure safe access to neighborhoods south of the city for longer periods of time.

1.4 Raise Veterans Dr. along Walther's Park to create a levee to protect housing and businesses.

1.5 Continue the improvement of stormwater infrastructure and the provision of street green infrastructure in De Soto to mitigate city runoff and limit backup into buildings.

1.6 Ensure the quarterly cleaning of storm drains to maintain adequate drainage as designed.

Objective 2: *Use nature-based and structural flood infrastructures to reduce flood damage to Main Street and key historic assets.*

2.1 Identify and modify or rebuild key bridges and culverts along Kingston St., Miller St., Highway 110, and Main St. to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.

2.2 Explore the feasibility of using targeted buyouts along the edges of the Joachim creek to widen and deepen the channel from Walther's Park up to the rail yard.

2.3 Develop upstream detention basins on available land to hold and then slowly release water as it moves through the city to limit the impact of flooding.

2.4 Explore the feasibility and impact of leasing private land adjacent to Joachim Creek for flooding in an emergency. In particular, explore the Belleville Property as a detention basin for flood waters.

2.5 Coordinate with DNR to periodically clean out invasive vegetation as well as flood debris deposits from Walther's Park to the rail yard

Objective 3: *Re-locate all emergency and critical service facilities out of the floodway, and promote the residential buy-out program.*

3.1 Raise or relocate the De Soto Rural Fire Station out of the flood plain.

3.2 Work with Union Pacific to protect or relocate the utility sub-station.

3.3 Work with Union Pacific to investigate the opportunity to raise the rail-tracks out of the 100 year floodplain.

3.4 Expand EMT services to be accessible on both sides of the Joachim Creek.

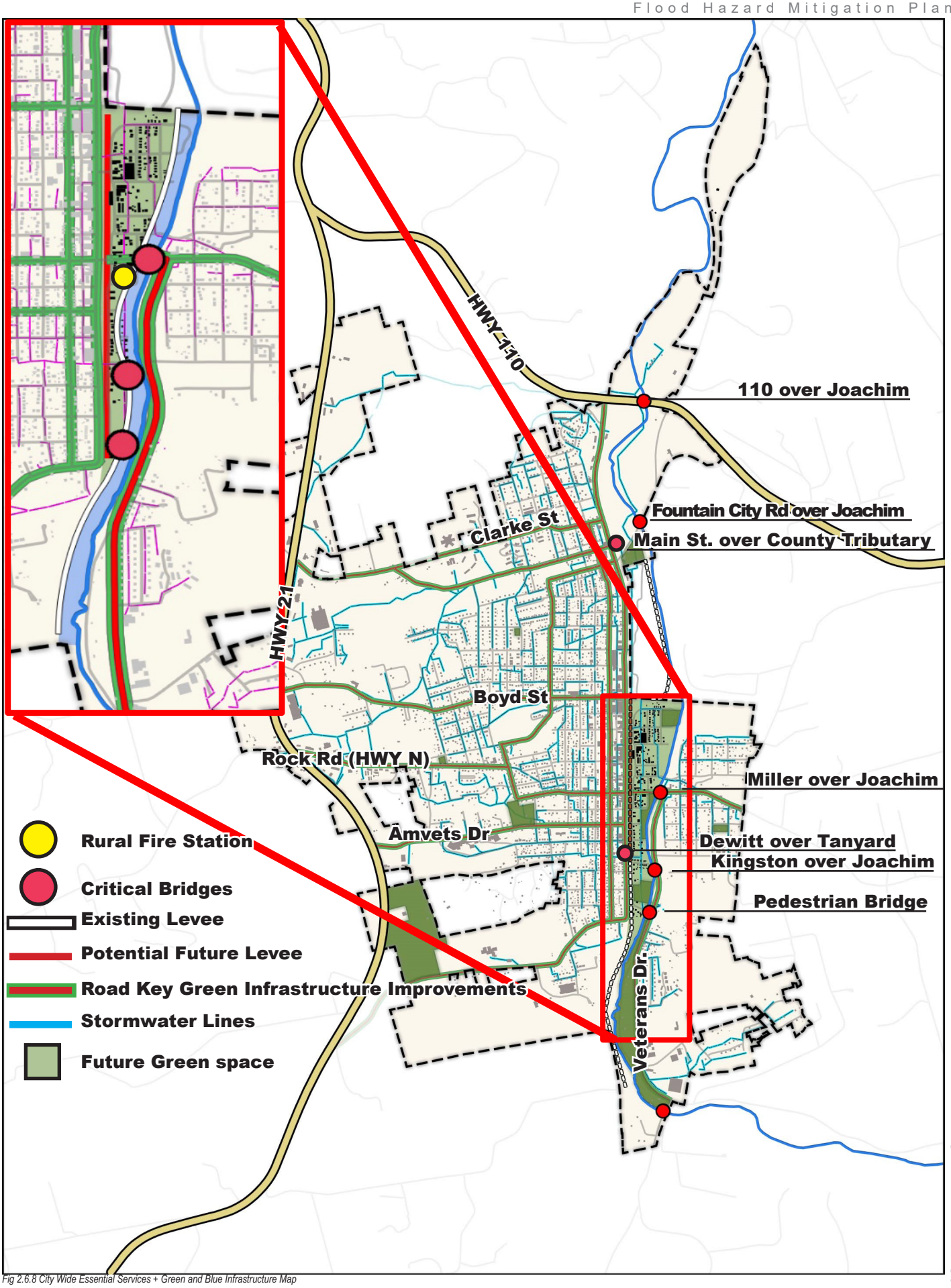


Fig 2.6.8 City Wide Essential Services + Green and Blue Infrastructure Map

GOAL 6: Public Policy + Regulation

Build a transparent system of accountability by codifying and enforcing mitigation best practices and development regulations that reduce stormwater and runoff impacts in the Upper Joachim Watershed.

Objective 1: Promote nature-based development and design standards and ecosystem services to limit the impact of stormwater runoff within the Upper Joachim watershed.

1.1 Update city building codes to require design in and adjacent to floodplains to address the 0.2% AEP event.

1.2 Follow best practices to mitigate runoff and construction impacts on the waterways by requiring storm captures on all new sites.

1.3 Develop a green infrastructure stormwater captures incentives program or grants program for existing residential and commercial properties to capture stormwater on site.

1.4 Advocate for better inspection and regulations for the dams and subdivisions upstream from De Soto.

1.5 Push for greater regulations in storm water and construction within the Upper Joachim Watershed as an overlay as opposed to the county as a whole.

Objective 2: Develop best practices land use regulations and a public green infrastructure plan for flood resiliency in the City of De Soto.

2.1 Continue acquiring land in the floodplain for the creation of green infrastructure throughout the city by developing and adopting a city buyout plan.

2.2 Develop a policy to revert land uses and zoning in the flood plain (repetitive loss properties and bought out properties) exclusively back to park, green, and open spaces for the development of green infrastructure for flood resiliency.

2.3 Enable the construction of higher density affordable housing by establishing a multi-family land use ordinance in the Main St. area.

2.4 Establish a land swap program land to create new affordable housing.

2.5 Within the regulated floodway do not permit new buildings or increased impervious surfaces without equivalent mitigation being provided on site or within the floodplain to ensure no (zero) rise in the 1% AEP flood water level.

Objective 3: Create a community support system for residents impacted by floods.

3.1 Create a city assisted relocation plan for property owners willingly selling their floodplain property.

3.2 Establish a flood evacuation and shelter program for flood households.

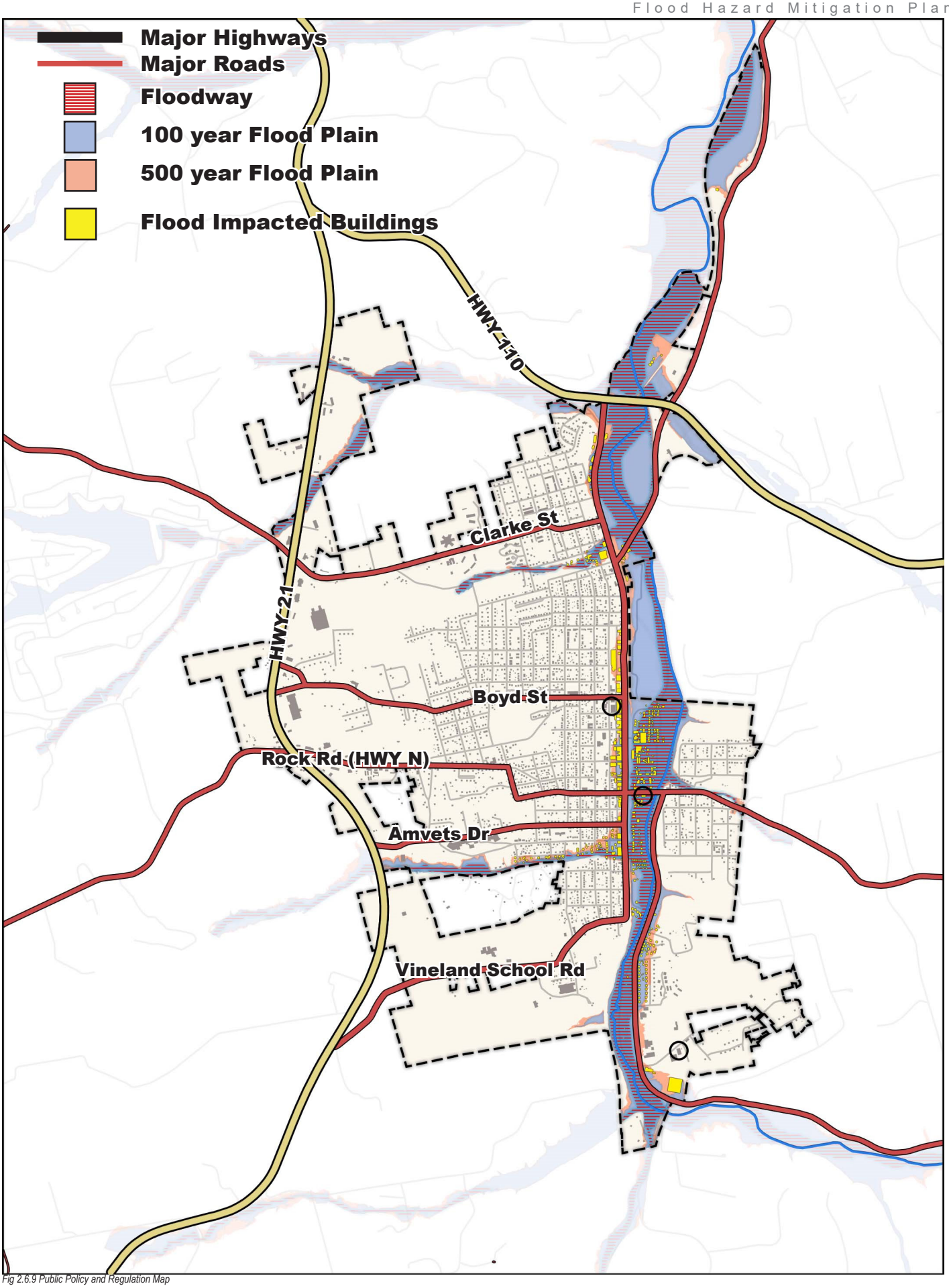


Fig 2.6.9 Public Policy and Regulation Map

GOAL 7: Risk Management Partnerships + Funding

Effectively utilize existing resources and expand sources of revenue to finance critical flood mitigation projects while improving the overall fiscal resiliency of the city.

Objective 1: Expand city, county and state organizational, financial, and development partnerships.

1.1 Increase participation with Jefferson County Economic Development Corporation and help to make the EDC a more relevant and forceful contributor to the metro area's economic development program.

1.2 To preserve and better manage Main Street as a major asset of the city, join and actively participate in the Missouri Main Street Connection, which is part of the national Historic Main Street program.

1.3 Continue exploring partnerships and funding opportunities with The Citizens Committee for Flood Reliefs connections to the Anthropocene Alliance.

Objective 2: Study the economic gaps and opportunities available to the City of De Soto and create a City of De Soto Economic and Community Development Comprehensive Plan.

2.1 Urge the Economic Development Corporation to update and create a new strategic economic development plan for the entire county.

2.2 Separately or in conjunction with the county, pursue a Comprehensive Economic Development Strategy (CEDS) process and document for the city itself. More deeply evaluate the city's economic strengths, weaknesses, and opportunities to create initiatives to build on those strengths and reduce weaknesses. A formal CEDS document improves opportunities for federal economic development funding.

Objective 3: Leverage local, state, and federal grant funding as well as non-traditional sources of funding to facilitate the herein flood resiliency programs and projects.

3.1 Look beyond traditional funding sources for all of the above for raising some of the existing homes. For instance, large crowdfunding campaigns, local and national church fundraising campaigns, grassroots fundraising campaigns that are strongly tied to the homeowners themselves, concerned De Soto residents or local charities/community groups.

3.2 Explore applying to major philanthropic organizations to improve flood resiliency, fund buyouts when appropriate, and promote/develop green infrastructure.

3.3 Assess and re-structure the use of the parks and stormwater tax to better serve mitigation priorities.

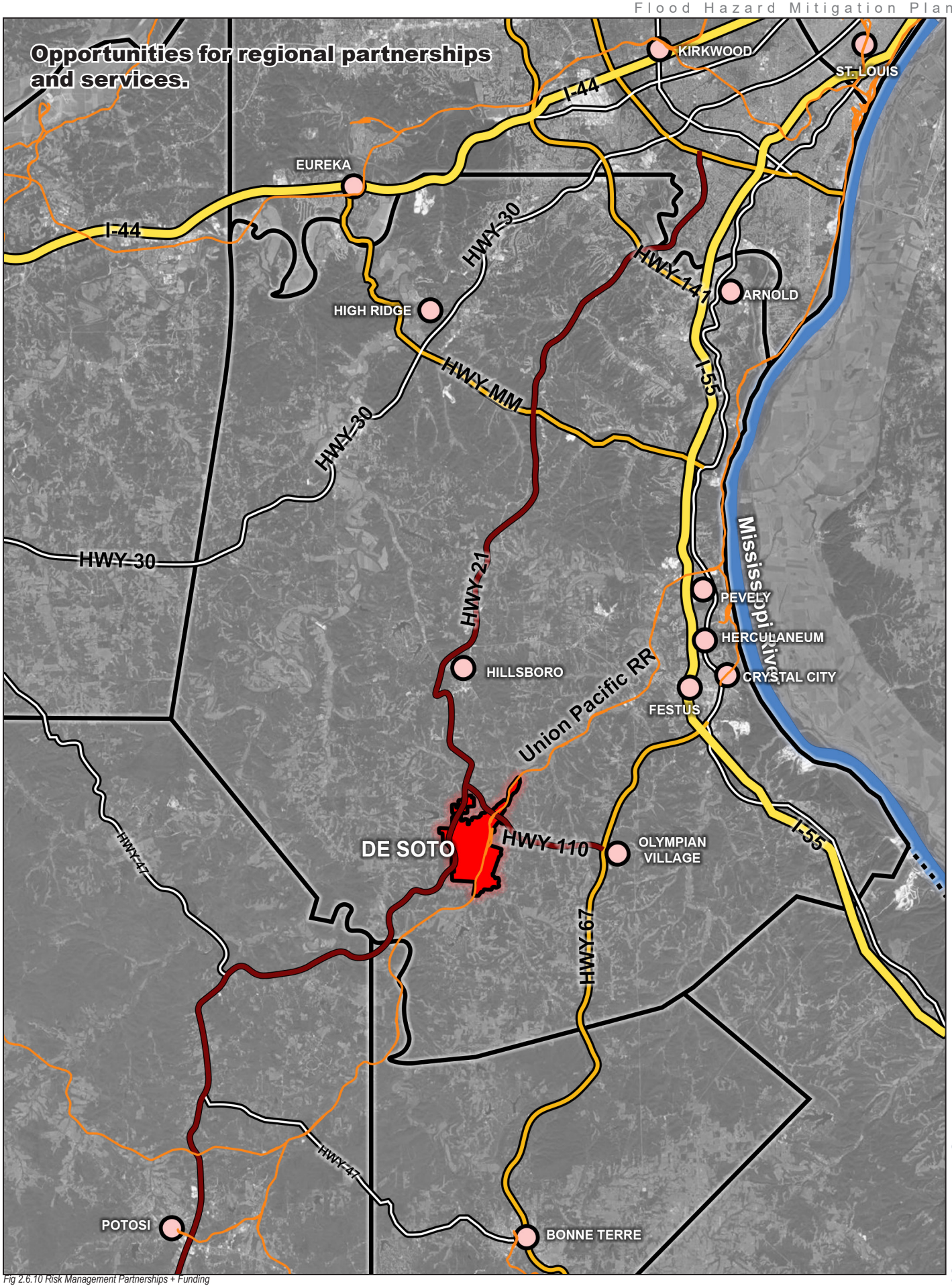


Fig 2.6.10 Risk Management Partnerships + Funding

Mitigation Strategy + Implementation Plan

After the review of existing and past planning strategies and a public engagement meetings with community residents to gather feedback and ideas on additional action items, the team developed a series of mitigation actions which were continuously vetted and updated with assistance from the community and working group during the public meetings. Based on past engagement and the identified issues and gaps to flood resiliency and safety in De Soto it was determined that the following priorities required specific action items. The plan needed to:

- **Address the flow of the Joachim Creek and its choke points**
- **Address increased communication, engagement and overall awareness of flooding**
- **Provide options for increased early warning metrics**
- **Assist De Soto in organizing for future projects, funding, and advocacy efforts beyond the boundaries of the city**
- **Acknowledge that while certain information and data was not available support for increased understanding was critical**
- **Support that people want to sell and move out of the flood plain areas and plan for the future use of the land**
- **Prepare the city for increased response capacity in times of emergency**

Based on the understanding of the needs of the community and city and the direction of the goals and objectives, the plan was developed to address the continuing, short term, medium term, and long term actions the city should take in the following categories:

- **Programs + Initiatives**
- **Policies + Regulations**
- **Partnerships + Funding**
- **Planning + Projects**

Prioritization of Action Items

Once the team identified potential action items they were vetted throughout the public engagement process with the community and working group. After the first round of action item feedback the team ran the action items through an adapted metric of the STAPLEE Criteria Worksheet provided by FEMA to prioritize and assess the timeline implications of the various action items. The STAPLEE prioritization matrix and results can be found in appendix H.

Mitigation Action Plan

The action plan and its action items was developed through engagement with the community, city, stakeholders, and internally the planning team to provide the City of De Soto a result of best actions to take in order to reduce the risk of flooding events on community resources, personal property, and most importantly life. Special focus was placed on increased resident education and awareness, implementing a voluntary buyout program and the regulations of the land these properties sit on, establishing partnerships to address problems in the watershed out of De Soto's control, and the protection of Main St. De Soto as a community and economic engine for implementation.

The resiliency plan recognizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan. It should also be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and re-prioritization due to funding availability and/or other criteria as deemed necessary by the city of De Soto. The City is not obligated by this document to implement any or all of these projects. This mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified flooding hazards. The actual selection, prioritization, and implementation of these actions should be further evaluated in accordance with grants, funding, and the priorities and capacity of the City of De Soto.

Continuing Action Items			
These are the action items that work to maintain a community that is informed, prepared, and capable of responding to flooding events.			
Action Item	**Supports Goal?**	**Key Players**	**Additional Notes**
1.Host an annual review/training workshop for all city and county staff and emergency response teams inclusive of conducting regular inventories of flood fighting equipment, resources, and materials in order to work toward investing and increasing the amount of rescue resources like rescue boats, medical supplies, tactical equipment, etc.	Goal 2, Goal 3	City of De Soto, Emergency Service Departments, County Emergency Management	This information and workshops should also be taken to residents to educate them on preparedness and emargency flood preparedness.
2.Continue the improvement of stormwater infrastructure and the provision of street green infrastructure in the City of De Soto to mitigate runoff and limit backup into buildings. Ensure the quarterly cleaning of storm drains to maintain adequate drainage as designed.	Goal 5	City of De Soto	Continue receiving CDBG funds for these projects
3.Continue to plan and implement bioswales and green infrastructure along the Joachim Creek and tributaries that create pollinator and wildlife habitats while reducing localized flooding, and promoting environmental education opportunities for the community.	Goal 3, Goal 4,	City of De Soto, MODNR	
4.Continue, strengthen and expand the buy-out program for voluntary and repetitive loss or vacant properties to implement green infrastructure and flood retention and mitigation projects.	Goal 1, Goal 4, Goal 5	City of De Soto, Buy-In Community Planning, Corps of Engineers	See Buy Out Plan - Appendix E for a detailed plan/recommendations
5.Continue growing city sales tax to benefit the parks and stormwater tax to fund future mitigation project implementations.	Goal 4, Goal 5, Goal 7	City of De Soto, Jefferson County Economic Development Office	
6. Continue testing floodway properties for mold and mildew and provide financial support to residents to treat mold as a major public health concern.	Goal 2, Goal 3	City of De Soto, County Health Department	Mold and mildew are already existing problems in area homes and were of significnat concern to residents. After flooding, the City must ensure they are the only authority inspecting properties to ensure the safety and well being of residents

Fig 2.6.11 Continuing Action Table

Short Action Items (0-3 years)

These are the action items that work to organize city and community systems and establish the foundation for future flood resiliency and mitigation programs, policies, partnerships, planning and projects.

Action Item	Supports Goal?	Key Players	Additional Notes
PROGRAMS & INITIATIVES			
1.Work with existing FEMA, SEMA, and City resources to distribute the "Homeowner's guide to living in a flood plain" which is to be distributed to all flood plain residents detailing their risks, preparation options, warning/alert systems, and evacuation procedures in times of a flooding emergency. Make it both a web and print resource.	Goal 2, Goal 3	City of De Soto, FEMA, Citizens Committee for Flood Relief	SEMA already has a resource that De Soto can take and retrofit as needed to distribute. Volunteer groups like the Citizens Committee can assist in distribuiiton and education given their relationship with flood affected residents.
2.Educate & assist all but especially vulnerable populations living in areas of high-flood risk in developing personal preparedness plans.	Goal 2, Goal 3	City of De Soto, Citizens Committee for Flood Relief	Resources exist on SEMA and FEMA websites to accomplish this. Consider developing started kits that can be distributed to residents and/or held as a resource when flooding strikes.
3.Distribute a yearly community brochure updating citizens on the city's progress towards flood resiliency, projects in the pipeline, and opportunities to stay informed and involved.	Goal 3	City of De Soto	This can take many forms including a door hanger or mailbox fliers. Incorporate it into the City newsletter.
4.Request that the National Weather Service Advanced Hydrologic Prediction Service (AHPS-River Forecast Center) lower the "action stage" for the Joachim Creek gage from 8 feet down to 6 feet, or as low as feasible.	Goal 2	City of De Soto, Jefferson County Emergency Management	The predictions and alert to evacuate are to remain at the discretion of the city manager based on best practices, predicted precipitation, and flow. 6' is a suggested warning stage to alert residents of the potential of flooding, the evacuation stage remains 8.
POLICIES & REGULATIONS			
1.Develop a policy to revert land uses and zoning in the flood plain (repetitive loss properties and public purchased or donated properties) permanently back to floodable park spaces for flood resiliency.	Goal1, Goal 5, Goal 6	City of De Soto	
2.Within the regulated floodway do not permit new buildings or increased impervious surfaces without equivalent mitigation being provided on site or within the floodway to ensure no (zero) rise in the 1% AEP flood water level.	Goal 6	City of De Soto	
3. Require public availability mandatory flood disclosures and evacuation information to renters in the Joachim Creek Floodplain.	Goal 3	City of De Soto	Area realtors are already committed to doing this and reporting others that are not disclosing information. Consider a partnership and support their efforts.
4. Document availability of flood insurance and nearby insured and ininsured properties to understand burden of costs	Goal 2, Goal 7	City of De Soto, SEMA	Many Residents have expressed an increase in cost to flood insurance making a living unaffordable. The CRS program was debated but was determined unfeasible for De Soto to pursue.
PARTNERSHIPS & FUNDING			
1.Establish a resident and business-based Upper Joachim Creek Watershed Conservancy to stimulate routine meetings, raise funding for projects, and lobby for regulations in the Upper Joachim Creek Watershed.	Goal 4, Goal 6, Goal 7	City of De Soto. County Emergency Management, MODNR, Citizens Committee for Flood Relief, SEMA	This should be a multi-disciplinary group with county, city, and community buy in. Advocacy and work should begin right away to plant the idea. Non-profit groups like Headwater Economics have experience working with and assembling like groups and can provide precedent for them.
2.Establish an Upper Joachim Creek Watershed Public Sector Management Board to develop and implement regulations and policies to increase flood resiliency and maintain the character and quality of the entire Upper Joachim Creek Watershed.	Goal 4, Goal 6, Goal 7	City of De Soto. County Emergency Management, MODNR, Citizens Committee for Flood Relief, SEMA	This should be a multi-disciplinary group with county, city, and community buy in. Advocacy and work should begin right away to plant the idea. Non-profit groups like Headwater Economics have experience working with and assembling like groups and can provide precedent for them.
3.Engage with the Corps of Engineers to support their pipeline projects for Infrastructure improvements and precipitation modeling.	Goal 5, Goal 7	City of De Soto	The Corps of Engineers indicated they will likely be conducting studies for future project in approximately 2-3 years. Maintain communication and support their efforts.
4.Continue exploring partnerships and funding opportunities with The Citizens Committee for Flood Relief connections to the Anthropocene Alliance.	Goal 7	City of De Soto, Citizens Committee for Flood Relief	Track the DNR sponsorship of the America the Beatiful Grant and participate with them on the application and project support.
5.Assess and re-structure the use of the parks and stormwater tax to better serve mitigation priorities.	Goal 1, Goal 5, Goal 7	City of De Soto, City Council	The tax is specifically stated to serve parks and stormwater, since a chunk of stormwater funding comes from CDBG grant funds can that portion from the tax be allocated to flood mitigation specific actions with stormwater and in the future could it be ammended to be explicit about it.
PLANNING & PROJECTS			
1.Continue coordination with USGS, SEMA, and the county to provide early warning systems such as an additional up-stream gauge as well as activated flood lights on dangerous roads and a public alert warning system/flood siren.	Goal 2, Goal 7	City of De Soto, SEMA, County Emergency Management	Continue exploring the possibility and expense of retrofitting the tornado sirens for flooding. Residents expressed that CODE RED is inconsistent with warnings.
2.Work with the National Weather Service to identify precipitation and flood patterns in the Joachim Creek watershed specific to amount of rain, direction, and water height.	Goal 2, Goal 4	City of De Soto, US Corps of Engineers, USGS	
3.Plan and implement Increased flood protection of Main Street through back-flow preventors, culvert gates, etc.	Goal 1, Goal 5, Goal 7	City of De Soto	Apply future CDBG and stormwater and parks tax funding to this initiative to salvage businesses on Main St.
4.Inspect flood affected properties for mold and mildew as part of a public health initiative to help affected residents in the floodplains.	Goal 2	City of De Soto	

Fig 2.6.12 Short Term Actions Table

Medium Term Actions (3-7 years)

These are the action items that build from the legal, organizational, and resource foundation of the immediate actions to begin planning and considering for the development of long-term projects.

Action Item	Supports Goal?	Key Players	Additional Notes
PROGRAMS & INITIATIVES			
1.Develop educational signage in recreational areas that are accessible to the public. This includes historic flood markers, historic impact images, safety and prevention education implemented throughout the city or in a similar way to the tree museum or exercise park that exist at Walther Park.	Goal 3	City of De Soto, Citizens Committee for Flood Relief	This is an initiative that the Citizens Committee has assisted in with the water marker at the Fire Station. Consider a partnership and target public area as well as vulnerable, high rental neighborhoods first.
2.Develop a "land swap" program to facilitate home-ownership relocation out of the flood way.	Goal 1, Goal 6	City of De Soto	
3.Join the Missouri Main Street Program, develop a marketing campaign and offer incentives to entice businesses and restaurants to remain on Main Street and improve the aesthetics and functionality of their buildings.	Goal 7	City of De Soto, Missouri Main Street Connection	
POLICIES & REGULATIONS			
1.Update city building codes to require design in and adjacent to floodplains to address the 0.2% AEP event.	Goal 6	City of De Soto	While De Soto already has standards for floodplain development and stormwater runoff, it is recommended to revisit and recalibrate to design for the predicted increase and intensity and frequency of precipitation and flooding events.
2.Develop and implement an overlay regulation for site-specific full storm-water retention and mitigation only within the Upper Joachim Watershed.	Goal 5, Goal 6	City of De Soto, Jefferson County, SEMA, MODNR	
3.Advocate for better inspection and regulations for the dams and subdivisions upstream from De Soto.	Goal 4, Goal 5, Goal 6	City of De Soto, US Corps of Engineers	
PARTNERSHIPS & FUNDING			
1.Establish a volunteer program with the local school which can count towards A+, NHS, or STUCO service hours which would help impacted residents clean and repair properties post floods and connect local youth with area professionals to learn about flood safety, readiness, and sustainability.	Goal 2, Goal 3	City of De Soto, De Soto High School, Citizens Committee for Flood Relief	
2.Create and formalize agreements to use private property for emergency access or as a floodway.	Goal 2, Goal 6	City of De Soto, US Corps of Engineers	A property to examine and assess feasibility for is the Belleville property which has been offered to the City to lease in the past.
PLANNING & PROJECTS			
1.Complete additional hydraulic studies to explore proposed Joachim Creek watershed management and infrastructure changes to reduce flooding in De Soto.	Goal 4	US Corps of Engineers, USGS	The Corps of Engineers is planning to complete additional modeling and studies for De Soto in the next 3-5 years. Support their efforts.
2.Re-configure buy-out properties, Walther Park, Richter Park, Shoe Factory site and Hopson Field into floodable park spaces following floodable park best practices that are still usable as recreational amenities when not flooding. Plan and implement an expanded Joachim Parks and Trail system.	Goal 1, Goal 6	City of De Soto	Support the Buy In Buy Out plan to secure the funds through the state program to push for additional buyouts. (Appendix E)
3.Study and identify all primary and secondary roadways used by workforce and emergency service providers that flood and develop plans to mitigate flood hazards and prioritize area evacuations. Identify another site for first responders West of the Joachim Creek to allow consistent access to the community even in times of flooding.	Goal 2	City of De Soto, US Corps of Engineers, County Emergency Management	Place special emphasis on the 5 key roads (Boyd, Veterans, Amvets, W Miller, Clarke) W Miller St. is the only crossing of the tracks in De Soto with access to the Eastern side of the City prioritize projects for its bridge and rail crossing.
4.Work with Jefferson County to relocate the De Soto Rural Fire station out of the floodplain and simultaneously study a combined resource facility for City's and County's departments to pool resources to be used as needed in times of emergency.	Goal 2, Goal 5	De Soto Rural Fire, County Emergency Management, City of De Soto	
5.Create a land use and property ownership inventory of possible development locations for affordable housing.	Goal 1, Goal 6	City of De Soto	

6.Develop a toolkit of diverse housing types and construction techniques that increase the range of affordability and are incorporated into the city's land-use plan and zoning code.	Goal 1, Goal 6	City of De Soto	Trends are showing communites will hire an architect to put together schematics for development. Developers can come in, choose a prescribed model, expedite their development process, and save on the overall construction cost.
7.Separately or in conjunction with the county, pursue a Comprehensive Economic Development Strategy (CEDS) process and document for the city itself. More deeply evaluate the city's economic strengths, weaknesses, and opportunities to create initiatives to build on those strengths and reduce weaknesses. A formal CEDS document improves opportunities for federal economic development funding.	Goal 7	City of De Soto, Jefferson County Economic Development Corporation	Jefferson County Economic Development Corporation Indicated that De Soto already has an economic development plan but that it needs updating and they can assist the City in doing so.
8.Develop an ecosystem services plan for the Upper Joachim Creek Watershed that improves flood resiliency, native plant and wildlife habitat restoration, mitigates pollution and provides increased public safety of the existing creek dams.	Goal 4, Goal 6	Jefferson County, City of De Soto	

Fig 2.6.13 Medium Term Actions Table

Long Term (7+ years)

These are the actions that build on the foundational, organizational, and structural work that lend themselves to larger development and infrastructure projects. The lead up to these projects often involves budget and fund acquisitions and partnership development.

Action Item	Supports Goal?	Key Players	Additional Notes
PROGRAMS & INITIATIVES			
1.Encourage the East of the tracks Main Street business to relocate their store fronts onto Main St. where they are safer and more accessible to community foot traffic.	Goal 1, Goal 7	City of De Soto	
2.Develop incubator business spaces along Main Street to act as startup opportunities for small businesses.	Goal 7	City of De Soto	
3.Continue advocating for the installment of an Amtrak rail stop in De Soto.	Goal 1, Goal 7	City of De Soto	
POLICIES & REGULATIONS			
1.Enable through code reform the construction of higher density affordable housing by establishing a multi-family land use ordinance in the Main St. area.	Goal 1, Goal 6	City of De Soto	
PARTNERSHIPS & FUNDING			
1.Partner with an area hospital to support the development of a small-scale clinic/medical facility in De Soto.	Goal 1, Goal 2	City of De Soto, Mercy Hospital, County Emergency Management	
PLANNING & PROJECTS			
1.Create a Strategic Plan for Main Street economic development that also includes "Main Street First" policies to limit relocation to other commercial corridors.	Goal 7	City of De Soto, Jefferson County Economic Development, Missouri Main Street Connection	
2.Comprehensively update the Emergency Action and Evacuation Plan with a formal public engagement process.	Goal 2, Goal 3	City of De Soto, US Corps of Engineers	
3.Identify and modify or rebuild key bridges and culverts along Kingston St., Miller St., Highway 110, and Main St. to be more hydraulically efficient, and raise at least one bridge to guarantee vehicular and pedestrian pathways across the creek even during flood events.	Goal 2, Goal 4, Goal 5	City of De Soto, US Corps of Engineers	Miller Street should remain a priority bridge since it is the only direct crossing across the Joachim Creek from the West and East sides of the City.
4.Support and actively participate in the update to the strategic economic development plan for Jefferson County.	Goal 7	City of De Soto, Jefferson County	
5.Plan and implement a pedestrian and bicycle linkage of Main St. as well as existing and future open space areas throughout the city to the Joachim Park and Trail system.	Goal 1, Goal 5, Goal 6	City of De Soto	This is the end use for buy-outs and should be marketed as such from the onset of the planning implementation process to achieve greater community support.

Fig 2.6.14 Long terms actions table

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Potential Grants and Funding Sources:

Five Star and Urban Waters Restoration Grant Program: This program seeks to develop community capacity by providing modest assistance to diverse local partnerships for river, wetland, riparian, forest and coastal restoration, and wildlife conservation. Water monitoring, stormwater management, source water protection, urban tree canopy restoration, and projects designed to prevent trash from entering waterways are just some of the types of projects that are awarded grants. The grants are administered by the National Fish and Wildlife Foundation's (NFWF) Five Star and Urban Waters Restoration Grant Program which supports projects that develop community stewardship of natural resources and address water quality issues.

Building Resilient Infrastructure and Communities: Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

Flood Mitigation Assistance Grant Program: Flood Mitigation Assistance is a competitive grant program that provides funding to states, local communities, federally recognized tribes and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. FEMA chooses recipients based on the applicant's ranking of the project and the eligibility and cost-effectiveness of the project. FEMA requires state, local, tribal and territorial governments to develop and adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for hazard mitigation assistance projects.

Hazard Mitigation Grant Program: FEMA's Hazard Mitigation Grant Program provides funding to state, local, tribal and territorial governments so they can develop hazard mitigation plans and rebuild in a way that reduces, or mitigates, future disaster losses in their communities. This grant funding is available after a presidentially declared disaster. In this program, homeowners and businesses cannot apply for a grant. However, a local community may apply for funding on their behalf.

Community Facilities Direct Loan and Grant Program (10.766): This program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings.

Urban Waters Small Grants: This program recognizes that healthy and accessible urban waters can help grow local businesses and enhance educational, recreational, social, and employment opportunities in nearby communities. Building a Movement One Partnership at a Time: The Urban Waters program strives to make a visible difference by working with a diversity of partners to support community driven solutions that connect the intrinsic value of urban waters with improving the livability and economic health of the community.

Multi-family Housing Loans Guarantees: The program works with qualified private-sector lenders to provide financing to qualified borrowers to increase the supply of affordable rental housing for low- and moderate-income individuals and families in eligible rural areas and towns.

Emergency Watershed Protection (EWO) Program Buyouts: The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection Program (EWP) to assist project sponsors in protecting lives and property from flooding or soil erosion after a natural disaster. In communities impacted by constant flooding or severe erosion due to a natural disaster, a property buyout might be the best solution.

Watershed Rehabilitation Program (REHAB) (10.916): To provide technical and financial assistance to rehabilitate dams originally constructed with assistance of USDA Watershed Programs. Rehabilitation must extend the life of the dam and meet applicable safety and performance standards. Priority is given to dams that maximize risk reduction and that could result in loss of life if the dam should fail.

NDSP State Assistance Grant Program (NDSP-SA): The NDSP-SA accomplishes this objective by supporting state and U.S. territory governments in the establishment and maintenance of effective State programs intended to ensure dam safety, protect human life and property, and increase the capacity and capability of State dam safety programs.

High Hazard Potential Dam (HHPD) Grant Program: The HHPD grant program accomplishes this objective by providing funding to state and U.S. territory governments for the rehabilitation of eligible high hazard potential dams that fail to meet minimum state dam safety standards and pose unacceptable risk to life and property.

Youth Conservation Program (15.546): Promote and stimulate public purposes such as education, job training, development of responsible citizenship, productive community involvement, and furthering the understanding and appreciation of natural and cultural resources through the involvement of local youth and young adults in the care and enhancement of public resources.

Water Infrastructure Finance and Innovation Act (WIFIA): The Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) established the WIFIA program, a federal credit program administered by EPA for eligible water and wastewater infrastructure projects.

Research and Evaluation, Demonstrations and Data Analysis and Utilization Program (HUDRD):

Three types of research project are solicited. Projects 1 and 2: Congress has provided funding that will allow HUD to evaluate the efficacy of its resilience expenditures. HUD is soliciting proposals to conduct two distinct, but related, research studies: (1) a cost-effectiveness evaluation that investigates long- and short-term benefits and costs of expenditures designed to reduce risk to people and property from flood hazards and increase resilience to flood impacts, with explicit focus on impacts to vulnerable populations, and (2) an assessment of implementation of flood resilience strategies, with a goal of identifying those implementation practices that have the greatest chance of being successful across a range of communities. Following on each study – the cost-effectiveness analysis and the implementation study – the respective research organization(s) will produce guidance tools for communities carrying out flood resilience strategies. The cost-effectiveness guidance will include practical methods of project

assessment that can be deployed by local communities and states with varying levels of capacity for assessing the benefits of resilience expenditures. Implementation guidance will include assessment of common implementation challenges and solutions and best practices for conceiving, planning, funding, and implementing flood resilience strategies, especially how to improve community participation and support of such strategies. For Project 3, HUD is funding co-operative agreements for pre-competitive research in homebuilding technologies that provide the homebuilding industry with new, innovative construction products or practices that lead to more affordable, energy efficient, resilient (in this sense, durable, disaster resistant, adaptable for future requirements, and maintainable), and healthier housing. This NOFA announces the availability of up to $4,708,000.

Resources:

The National Park Service – Rivers, Trails, and Conservation Assistance program (NPS-RTCA): Supports locally-led conservation and outdoor recreation projects across the United States. NPS-RTCA assists communities and public land managers in developing or restoring parks, conservation areas, rivers, and wildlife habitats, as well as creating outdoor recreation opportunities and programs that engage future generations in the outdoors. NPS-RTCA does not provide financial assistance or monetary grants. As a collaborative partner, we provide professional services to help you achieve your conservation and outdoor recreation project vision. Through an application process, community groups, nonprofit organizations, tribal governments, national parks, and local, state and federal agencies can apply for NPS-RTCA technical assistance.

Urban Waters Federal Partnerships: The Urban Waters Federal Partnership (UWFP) seeks to reconnect urban communities, particularly those that are overburdened or economically distressed, with their waterways to become stewards for clean urban waters. Through the Partnership, communities gain economic, environmental, and social benefits, and collaborate with Federal agencies, state and local agencies, and community-led efforts to achieve common goals.

Extension Disaster Education Network (EDEN): Database of community education resources for flood and disaster impact resiliency including but limited to: mold removal, disaster preparation, low-cost emergency supplies, power outage resources, food safety, financial preparation, flooding.

AmeriCorps VISTA: Volunteers in Service to America (VISTA) is an anti-poverty program designed to provide needed resources to nonprofit organizations and public agencies to increase their capacity to lift communities out of poverty.

AmeriCorps NCCC: AmeriCorps members serving in the NCCC program are assigned to one of four regional campuses and then placed into teams ranging between 8-12 members. The teams complete a variety of service projects, which are generally 3 to 13 weeks in duration, and respond to local communities' needs throughout the United States and territories.

Regional Resiliency Assessment Program: A voluntary, cooperative assessment of specific critical infrastructure that identifies a range of security and resilience issues that could have regionally or nationally significant consequences.

Building Private Public Partnerships Guide:
https://www.fema.gov/sites/default/files/documents/fema_building-private-public-partnerships.pdf

This guide provides recommendations and resources for a jurisdiction to establish and maintain a P3 to help coordinate mitigation, response and recovery planning and preparedness. Collaboration helps both public and private sector community stakeholders at all levels increase resilience. The models in this guide highlight interdependencies among businesses, industries, community organizations and government agencies. The models apply to both rural and urban jurisdictions. The recommendations help jurisdictions develop, manage and scale P3s to strengthen health and safety, economic security and community resilience. At the core, a P3 connects people, builds relationships and breaks down barriers so that representatives from private, nongovernmental and public organizations know each other prior to an incident affecting their jurisdiction.

2.7
PLAN ADOPTION

Plan Adoption - Future Objective

The formatting of this document is consistent with the FEMA guidelines for local mitigation plans. If the City of De Soto chooses to adopt this plan as an official city document in the future it can also opt to submit the planning document to FEMA for official federal approval. If adopted, part of the FEMA approval process is for De Soto to submit proof of adoption as part of the mitigation document. If the case arises where De Soto decides to pursue FEMA approval (Recommended Action) then this Chapter of the plan should be substituted for the adoption evidence. The FEMA approval process is presented below for City Reference.

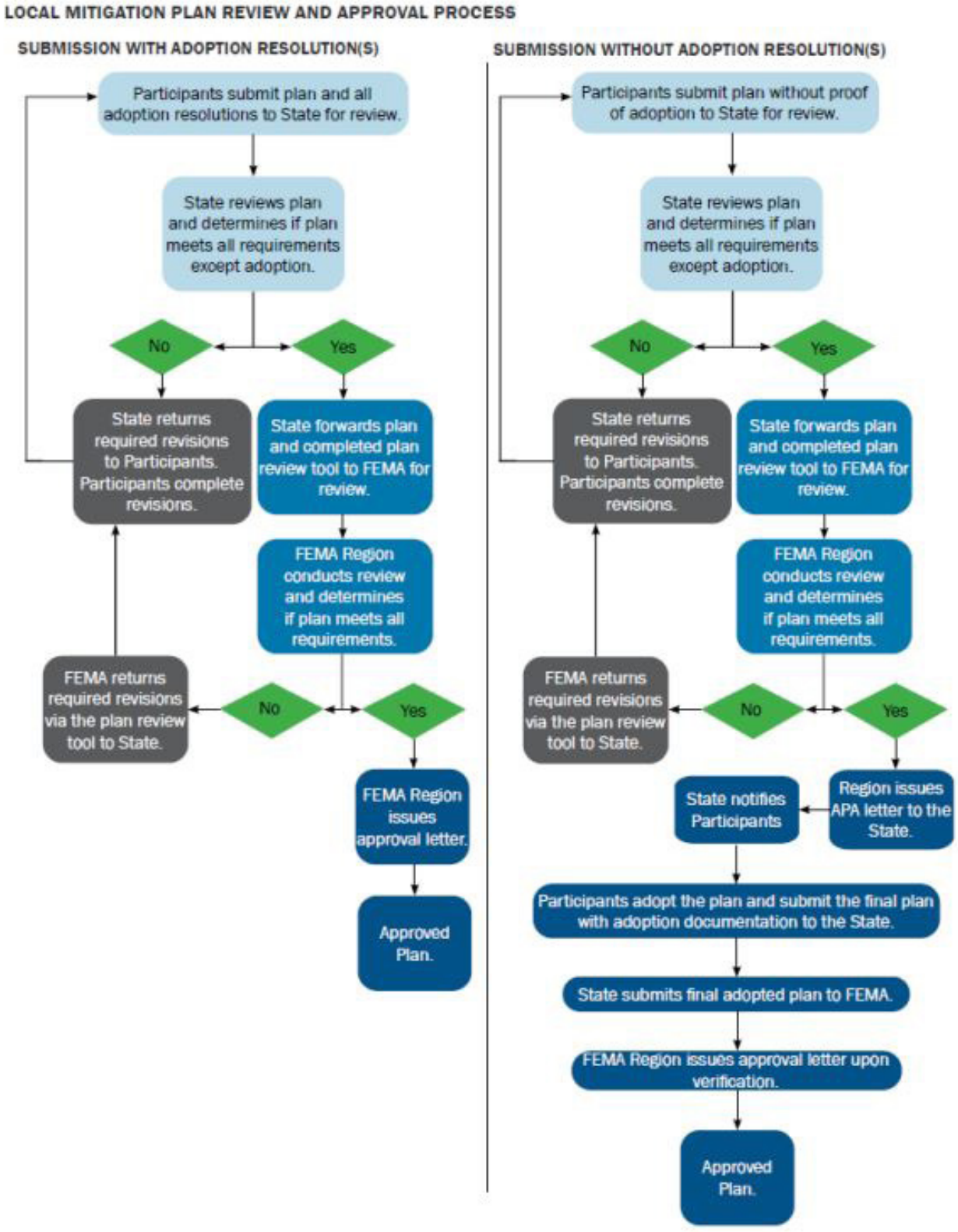

Figure 1: Local Mitigation Plan Review Process

Fig. 2.7.1 Local Mitigation Review Process Table

2.8

PLAN IMPLEMENTATION & MAINTENANCE

Introduction

Implementation and maintenance of the hazard mitigation plan is critical to ensuring its success and future relevance to the city of De Soto. This chapter will outline the recommended methods and schedules for monitoring, updating, and evaluating the hazard mitigation plan overtime. This section also indicates how the plan can serve future planning initiatives for the city, watershed, and county as well as continued public engagement practices.

Implementation

For the hazard mitigation plan to be effective and improve the conditions of the city it must be successfully and carefully implemented. In chapter 7, the hazard mitigation plan presents a series of action items recommended to work toward improving the resiliency of the city. While the plan outlines a recommended time frame and priority actions to be taken, it is important to recognize that circumstances change. It will be role and responsibility of the City of De Soto to assess the recommended action items over time, planning to complete and implement them based on financial and labor capacity of the city. The low to no cost actions, or those that are already underway or easily fund-able/implementable by the city and its existing budgets, grants, and departments are often some of the most successful. A few projects the City of De Soto already undertakes include:

- **Buying out vacant and foreclosed property when available in high risk flood areas.**
- **Improving the condition of stormwater infrastructure and updating the city wide systems.**
- **Code requirements for water detention on site.**

A few of the city systems have recommendations for expanded efforts in the plan mitigation and action items. Building on the foundation of these existing programs is critical to a more effective implementation since it is resources and projects the city already has and is dedicated to.

Responsibility and Delegation of Implementation

The success of the plan will depend on its active role and discussion in the day to day operations of the city, its functions, and priorities. This effort is achieved by delegating critical projects, hosting coordination meetings, proactive budgeting and grant pursuits, enforcing initiatives, strategic planning efforts, involving partners where applicable, and city/community education opportunities. The following actions are recommended to the city by the planning team to effectively monitor and implement the plan:

- Establish a city, relevant partners, and resident implementation committee to coordinate on projects and track implementation progress. Recommended partners for this committee would include:
  - City Manager
  - Floodplain Administrator
  - Director of Public Works
  - Director of Parks and Recreation
  - Citizens Committee for Flood Relief
  - Buy-In Community Planning
  - Relevant County Partners & Leaders

- Developing a dedicated position for tracking grants, applications, and tracking funding opportunities/campaigns.
- Clearly designate and delegate projects most relevant to existing departments and ongoing city work
- Update strategic planning efforts for existing city departments to include action items and priorities of the hazard mitigation plan.
- Comprehensively review City budget to determine the projects that can be easily funded, where funds should be allocated in the coming years for projects, and what projects will need additional sources of funding.
- Establish the city benchmarks for the next 5 years before the comprehensive hazard mitigation plan update based on the recommended priority actions and timelines of the plan.
- Quarterly review the progress of the implementation mechanisms adjusting as needed according to city priorities or unexpected and unforeseen challenges that may ensue.
- Continue to engage the planning process implementation work group to assist in pushing county level recommendations and watershed scale efforts of the plan.

Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblock, or changing circumstances are recognized.

Maintenance Schedule

The De Soto City Manager, also recognized as the floodplain administrator, is responsible for initiating plan reviews and reporting out on the successes of the plan. If the city decides to pursue FEMA approval of the plan as an added resource then the City will continue to submit 5 year written updates to SEMA and FEMA of the City's hazard mitigation plan. If disaster and unexpected circumstances occur the City should consider the ways in which the plan should be updated to respond to new found challenges or considerations as a result. Should this plan be sent for approval in the year 2023, then the next update would occur in the year 2028.

Maintenance Evaluation Process

To evaluate the plan the city must monitor and record changes in the overall vulnerabilities assessed as part of the plan which include:

- Decreased vulnerability as a result of implementing recommended actions.
- Increased vulnerability as a result of failed or ineffective mitigation actions.
- Increased vulnerability as a result of new development.

- Updates to the plan will:
  - Consider changes in vulnerability due to action implementation;
  - Document success stories where mitigation efforts have proven effective;
  - Document areas where mitigation actions were not effective;
  - Document any new hazards that may arise or were previously overlooked;
  - Incorporate new data or studies on hazards and risks;
  - Incorporate new capabilities or changes in capabilities;
  - Incorporate growth and development-related changes to inventories; and
  - Incorporate new action recommendations or changes in action prioritization
  - Actively involve and engage the public to educate and assess public opinion of the plan success.

The plan will be updated to review the planning recommendations and re-prioritize city goals and initiatives based on funding and working capacity of staff and officials. It will also incorporate recommendations of any new studies or plans as are currently in the works by the US Army Corps of Engineers and Citizen's Committee for Flood Relief. Updates to the plan will annotate and review this document and produce updates to sections and the recommendation as needed. The update can be conducted as an internal review process by the City of De Soto - or as an effort taken on by outside consulting teams and partnerships as was the development of the 2023 hazard mitigation plan for De Soto. The update should engage the public and collect/incorporate public feedback to garner support.

Throughout this process the team observed that to achieve an adequate level of engagement in the community an extensive outreach program for public comment and support should be produced.

The team found the following actions to work well in achieving larger than normal turn-outs at these events and recommends the following options to inform residents of the update process:

- Coordinate with the local newspapers to publish articles, meeting notices, and the events to their calendars.
- Contact local radio stations to advertise the public engagement on the morning shows.
- Post flyer's in local area businesses, popular parks, and public institutions like the library and community center.
- Work with local organizations to advertise on Facebook, Instagram, and Twitter or other social media sites and platforms. Facebook has many local information groups the city could publish announcements in, the city has a Facebook, the chamber of commerce has a Facebook. The Citizens Committee for Flood Relief has a Facebook.
- If feasible, gather a volunteer group to distribute fliers into individual mailboxes around the city and or targeted areas.
- Announce meetings on the city website and red board.
- Host a website specific to the update process to distribute reports and planning process information.

Existing and Future Planning Efforts

For the hazard mitigation plan to be successfully implemented it must work to support and use, where applicable, the mechanisms, funding structures, and recommendations of other local, regional, and state planning efforts. These additional plans have already laid a foundation for the work ahead and can assist the City in developing and advocating for future implementation. The existing plans and mechanisms available to De Soto for this effort include:

- ***The St. Louis Regional Hazard Mitigation Plan (2020-2025)***
- ***The De Soto Emergency Action and Evacuation Plan (2021)***
- ***Upper Joachim Creek Floodplain Management Plan (2019)***
- ***USGS 2D Hydraulic Analyses of Joachim Creek (2021)***
- ***Jefferson County Master Plan (2003, currently being updated)***
- ***Jefferson County Roadway Master Plan (2021)***
- ***Route 21 Corridor Plan by MODOT***
- ***Jefferson County Road Safety Plan (2019)***
- ***APA Historic Downtown: Nature Based + Green Infrastructure Flood Resiliency Framework Plan (2021)***
- ***City ordinances and codes***
- ***CDBG funded grant for stormwater improvement***
- ***Stormwater and Sewer Tax***
- ***Non-profit and Local Organization Efforts***

The plan acknowledges that there will be other organizations and interested parties working towards implementing flood resiliency strategies. The leadership team of the City will need to monitor existing and future planning efforts to ensure the resiliency and mitigation strategies of the plan are incorporated into the planning processes as a key foundational element.

Future Public Engagement

Continued public engagement is important to the successful implementation of the plan. Throughout the implementation cycle the planning team has recommended the City conduct surveys and interviews to assess public perception and overall community gain of the recommended action items in De Soto. This engagement must also carry through in outreach to continuously and consistently form a community that is informed, engaged, and prepared when flooding occurs.

For the plan update process, public engagement will be critical in assessing the evolving needs and concerns of residents. It will also be beneficial to assess the effectiveness of the City's educational and outreach campaigns for Flood Resiliency. Given that De Soto has a large rental population in the floodplain and that resident turn over is a common occurrence in the affected area, the engagement of new residents will serve to assess how easily/accessible flood information and knowledge is to residents and how effective it is in preparing for flood events. In order to assess the necessary changes from a resident point of view the planning team recommends the city continue to vet the plan through public meetings, stakeholder engagement, and where applicable surveys.

Additionally, a marketing and outreach campaign will be critical to getting high levels of participation in the planning process. The city should assign a committee to help distribute outreach resources during the planning events at community events to better disseminate information for the planning process. This includes paper, social media, web, and telephone communications when possible.

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Figures and Illustrations

Section 1: Executive Summary

Section 2: Resiliency Plan

2.1 - Community Profile

2.2 - Plan Update

2.3 - Planning Process

Figures and Illustrations

2.4 - Risk Assessment

2.5 - Capability Assessment

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2.6 - Mitigation and Action Plan

2.7 - Plan Adoption

Notes

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City of De Soto