The Long-Term Economic Analysis of the Proposed Suncoast Connector Toll Road Project – Final Report

Prepared for:

Tall Timbers

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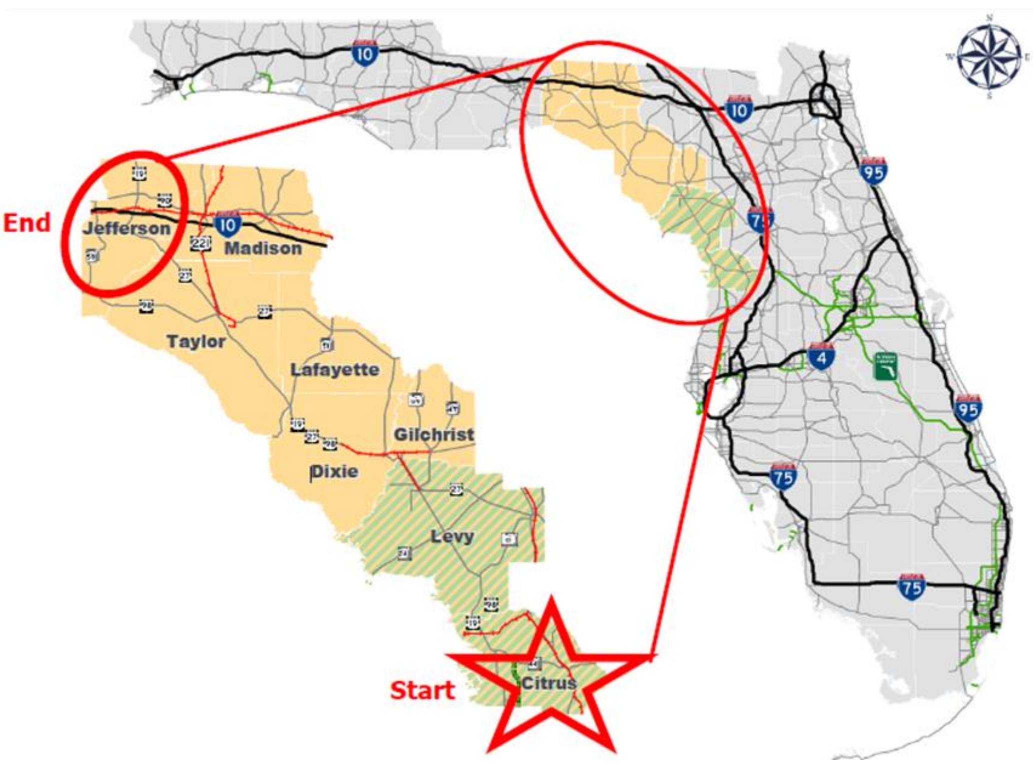

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Executive Summary

Tall Timbers commissioned the FSU Center for Economic Forecasting and Analysis to conduct an economic impact study of the proposed Suncoast Connector Toll Road in the eight county Big Bend Region in Northwest Florida. One of the goals of the project is to provide Tall Timbers with a comprehensive economic study that fully documents the long-term economic impacts of the region as a result of the Suncoast Connector project. In addition, the research team performed a literature review of previous major road construction projects studies and conducted a vulnerability analysis.

Background — Earlier this year, the Florida Legislature approved the construction of three toll roads that would span more than 300 miles across Florida. One of these roads is the Suncoast Connector Toll Road, which is proposed to extend more than 150 miles from Citrus County to Jefferson County in the Red Hills. The Red Hills region is one of the most ecologically significant areas of the Gulf Coastal Plain. Significant investments in private and public conservation efforts have protected over 40 percent (200,000 acres) of the Red Hills landscape. The Red Hills contains some of the last remnants of the nation's longleaf pine forests, numerous imperiled species, and critical water resources including the Floridan Aquifer and the watersheds of several designated *Outstanding Florida Waters* that feed into and protect highly productive Big Bend coastal waters.

On the path northward, the proposed toll road would pass from Jefferson to Citrus County, through the Big Bend counties of Levy, Dixie, Taylor, Jefferson, Citrus, Gilchrist, Lafayette, and Madison. These working rural communities comprise the core of the longest stretch of undeveloped coastline in the continental United States. The Big Bend also includes some of the most heavily forested areas in Florida's "wood basket", which in turn support the health of rivers, creeks, springs and estuaries, protecting one of the world's most productive commercial and recreational fisheries on the Gulf Coast.

Impacts of the Suncoast Connector

Background — In 2019, the Florida Legislature approved the construction of three toll roads that would span more than 300 miles across Florida. One of these roads is the Suncoast Connector Toll Road, which is proposed to extend more than 150 miles from Citrus County to Jefferson County in the Red Hills. The Red Hills region is one of the most ecologically significant areas of the Gulf Coastal Plain. Significant investments in private and public conservation efforts have protected over 40 percent (200,000 acres) of the Red Hills landscape. The Red Hills contains some of the last remnants of the nation's longleaf pine forests, numerous imperiled species, and critical water resources including the Floridan Aquifer and the watersheds of several designated *Outstanding Florida Waters* that feed into and protect highly productive Big Bend coastal waters.

On the path northward, this study assumes the proposed toll road would follow a similar path as the current US19, and pass from Jefferson to Citrus County, through the Big Bend counties of Levy, Dixie, Taylor, Jefferson, Citrus, Gilchrist, Lafayette, and Madison. These working rural communities comprise the core of the longest stretch of undeveloped coastline in the continental United States. The Big Bend also includes some of the most heavily forested areas in Florida's "wood basket", which in turn support the health of rivers, creeks, springs and estuaries, protecting one of the world's most productive commercial and recreational fisheries on the Gulf Coast.

General Economic Impact of the Suncoast Connector Toll Road

Public capital investment projects are conducted for different reasons; e.g., need, economic benefits of use, and impact of construction.

- Regarding the need factor, it is noted that a toll road is not needed from a transportation perspective as US19, for much of its path north of Citrus County, operates at only 16% of its maximum capacity.[1] Thusneed has not been demonstrated for the major stretch of the potential trajectory of the toll road.
- Local need for a new Suncoast Connector is probably rather low as well.
- A recently released TaxWatch study found that the Suncoast Connector is a risky project with a likely large price tag and little demonstrated transportation need. Complicating the process is that the project is moving forward while COVID-19 has the state facing major reductions in government revenue-including gas taxes and tolls.[2]
- A potential marginal benefit, of using a new constructed Suncoast Connector road, is levied away with a toll, reducing its potential use (as there is the alternative of using US19).
- Public capital projects nowadays have significantly lower economic impacts than similar projects in the past. Mean rates of return to highway capital across state-level studies are close to zero.[3] Amongst others: "Finding the case for more government

[1] Personal Communication, Tall Timbers, Neil Fleckenstein, May 29, 2020.

[2] Florida TaxWatch, Florida TaxWatch Report, July, 2020. Retrieved from: https://floridataxwatch.org/Research/Full-Library/ArtMID/34407/ArticleID/18903/The-Suncoast-Connector-What-We-Still-Need-to-Know

[3] Pender J., and M. Torero (2018). "Economic Impacts, Costs and Benefits of Infrastructure Investment—Review of the Literature," Issue Reports 277662, Farm Foundation. See: http://ageconsearch.umn.edu/record/277662/files/FP%20PenderTorero.pdf

investment is significantly weaker than commonly asserted" (Bourne, 2017),[4] "Job creation is no slam dunk", and "spending on infrastructure can easily be wasted" (Schmitt, 2017).[5]

- Public capital projects have greater economic impact on the Federal level than they do on the State level, and ultimately County levels (due to leakage of impacts outside smaller defined areas, and with highway capital scoring being rather low to begin with).
- Rural interstate and off-interstate counties seem to exhibit few positive effects, while negative effects are numerous. Overall, there are no permanent local Gross Regional Product (GRP) effects.
- There is direct and permanent loss of land as input for natural resource production. This loss will be in excess of necessary land to be used for construction, due to indivisibilities and sustenance, as well as land buffers in-between to prevent pollution from entering the food chain and ecosystem.
- Potentially part of the land lost will be in areas where the government has already spent millions to preserve natural conditions.

Long - Term Economic Impacts of the Suncoast Connector Toll Road

If the Suncoast Connector were to bypass the towns of Perry, Monticello, Chiefland, and Cross City, there would be some expected revenue (and job) losses to these towns. Based on a conservative Long-Term cost approach, the following economic impacts were derived using IMPLAN economic modeling software.

Table ES1. Total Long-Term Economic Impacts Loss Based on Suncoast Connector Bypassing Perry, Monticello, Chiefland, and Cross City Florida (2020$)

County	Output	Jobs	Income
Perry	$12,024,783	124	$3,557,043
Monticello	$2,128,231	25	$738,007
Chiefland	$12,017,524	134	$3,446,917
Cross City	$1,844,315	21	$645,487
Total	**$28,014,853**	**304**	**$8,387,454**

As shown in Table ES1, the total expected economic long-term losses due to the proposed Suncoast Connector road project are estimated to be $28 million in total economic output

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[4] Bourne R., (2017). Would More Government Infrastructure Spending Boost the U.S. Economy? Policy Analyses report, CATO Institute. Retrieved from: https://www.cato.org/publications/policy-analysis/would-more-government-infrastructure-spending-boost-us-economy

[5] Schmitt A., (2017). Is Infrastructure Spending Good for the Economy? It's Complicated. STREETSBLOG USA. Website: https://usa.streetsblog.org/2017/09/21/is-infrastructure-spending-good-for-the-economy-its-complicated/

(sales/revenues), 304 jobs, and $8.4 million in income. Both Perry and Chiefland sustain larger losses in terms of $12 million each in output, and about $3.5 million each in income, and 124 and 134 in projected job losses, respectively.

Other Economic Impacts of the Suncoast Connector

- There may be an accessibility premium reflected in higher land prices, and higher house prices. However, this will only be the case in optimal conditions, and where housing becomes available within a range from employment centers (cities >25,000 residents). Equally there may be negative externalities (*i.e.* lower property values) due to traffic intensity, and noise pollution. A real local issue is accessibility to the "other side" of the toll-road, necessitating permanent detours, and hampering local economies.
- Highway bypasses will impact local businesses, *i.e.*, the local economy will undergo structural changes. "About three-fourths (76%) of the firm representatives thought their retail sales would have been higher … if the bypass had never opened." (Babcock, 2003)[6].
- Adjustments will especially be seen with tourism-oriented businesses, where traditional recreation may see declines of up to 50 percent. U-shape local market adjustment seems applicable, with phasing often stretching over a decade (building or enticing new user market segments).
- Local employment will see frictions, and adjustment will take time. It is estimated that the bypass of e.g. Perry, Monticello, Chiefland and Cross City, will cost a significant loss of over 300 permanent full time equivalent (FTEs) Jobs.
- Social exclusion will probably enhance, as more people will drive by rather than stop for a detour from a new toll road, than from the present US19.

Vulnerability Analysis of the Suncoast Connector Toll Road

This study also examined and identified the areas that should be viewed with special consideration given their vulnerability assessment, using Geographical Information Systems (GIS). The information is useful in prioritizing the areas of highest vulnerability along the proposed Suncoast Connector roadway throughout the eight counties.

In the first grouping of GIS Figures, the Suncoast Connector is represented by land use categories (e.g., Residential, commercial, industrial, agricultural, institutional, governmental, or miscellaneous), and also includes Florida Forever and Florida Natural Areas Inventory

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[6] Babcock M.W., and J.A. Davalos, "Case Studies of the Economic Impact of Highway Bypasses in Kansas", Journal of the Transportation Research Forum, 2010. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.353.4113&rep=rep1&type=pdf

(FNAI) Conservation Lands map layers. In the subsequent five Figures, the outline of the Suncoast Connector overlays the Critical Lands and Waters Identification Project (CLIP) map layers. CLIP is an organized set of natural resource data layers that are combined into five resource categories: biodiversity, landscapers, surface water, groundwater, and marine.[7] Using an aggregated CLIP model, these five natural resource data layers are further differentiated by five priority levels for natural resource conservation.

To summarize, the Suncoast Connector will be expected to impact the following vulnerable lands:

- In Jefferson & Taylor County – Along Oakhill Conservation Easements, Mount Gilead Conservation Easement, Lick Skillet Conservation Easement, and near Middle Aucilla Conservation Easement and Area[8]
- In Taylor County – Through Ecofina Conservation Area
- In Dixie County - Cuts Through Upper and Lower Steinhatchee Conservation Area
- In Dixie, Levy & Gilchrist Counties – Through Wannee Conservation Area & right through Fanning Spring State Park
- Levy County – Next to Waccasassa Conservation Area, and right through NATC Gulf Hammock Conservation Easement & directly brushes along Florida Forever lands & the Goethe National Forest lands.
- Levy and Citrus Counties – Through Marjorie Harris Carr Cross Florida Greenway State Recreation & Conservation Area and next to Crystal River Preserve State Park (Florida Forever lands).
- Citrus County – Continues along Crystal River Preserve State Park and next to Upper Coastal Mitigation Bank, Cumming Preserve Bluebird Springs Park, Withlacoochee State Park (Florida Forever lands), and next to Chassahowitzka River & Coastal Swamps (FNAI Conservation lands). It is expected to cut through Chassahowitzka River & Coastal Swamps and Annulteliga Hammock (Florida Forever lands).

With respect to the next section of the vulnerability analysis, which were constructed using the natural resource data, or the CLIP, map layers, the following counties and associated priority levels can be observed to be at greatest at risk:

- **Biodiversity Resource Priorities**: Most at risk are Citrus and Levy Counties (with about 50 percent Priority 2 Levels). Citrus County also include some Priority 1 Level areas. It should be noted that the highest priority areas (e.g. 1 & 2) indicate the rarest of most vulnerable species but all priority levels have conservation value.

[7] See: https://www.fnai.org/pdf/CLIP_v4_user_tutorial.pdf
[8] It should be noted that all conservation easements can be found at: https://www.fnai.org/webmaps/ConLandsMap/

- **Landscape Resource Priorities**: Citrus County is all Priority 1 & 2 areas, and it should be noted that Levy County is at least 50 percent Priority 1. Priority 1 indicates a "Greenways Critical Linkage" area.
- **Surface Water Resource Priorities**: For Citrus County, the Suncoast Connector can be expected to skirt along at least 60 percent of Priority 1 & 2 Levels. For Levy County, the Suncoast Connector can be expected to cut through all the Priority 1 tributaries in the county. It will have a detrimental impact on these highly sensitive and vulnerable waterways draining to the Gulf.
- **Aquifer Recharge (Groundwater):** For Citrus, Levy, Dixie and Taylor Counties, they appear to contain a large percentage of Priority 1 and 2 Levels of Groundwater. Priorities 1 and 2 indicate the highest potential for recharge to springs or public water supplies.

Based on the vulnerability analysis findings, the research study team concurs with the following findings regarding the two recently released UF studies:

"This assessment of relevant GIS data on focal species, natural community, wildlife corridor, surface water resources, ground water resources, forest resources, and existing and proposed conservation lands shows that a new toll highway including a modified US19 corridor to accommodate a new highway would have very significant impacts on the ecological resources of what is currently one of the most rural regions with highest ecological integrity in Florida. There is no way to build a new or modified highway facility crossing most of this region without very significant impacts including to the habitat and wildlife corridors needed to support fragmentation-sensitive species, allow for coastal adaptation to sea level rise, maintain functional surface water hydrology for the many significant river systems, including the Suwannee River, that play an essential role in the ecological integrity of the coastal estuary of the Big Bend, which includes one of the biggest sea grass waterscapes in the United States. "

"To minimize negative impacts within the study area, new infrastructure must be strategically located to direct growth in ways that considers both near term impacts on existing communities, agriculture, and natural resources, and reduces future vulnerability to storms and sea level rise. However, the probability of significant and irreversible change in the study area, coupled with a high degree of vulnerability to existing and future coastal hazards suggests that this region has low suitability for supporting the kind of new highway and infrastructure corridor proposed in the M-CORES project."

Environmental Impacts of the Suncoast Connector Toll Road

Some environmental impacts highlighted from the literature review (unfortunately not monetized) are:

- Animal species will be at a disadvantage in landscapes with roads due to reduced population sizes (traffic mortality or roadkill) and reduced movement between complementary resources (because of fragmentation and isolation).
- There are effects of roads on ecosystems, including changes to hydrology and water quality, noise, and other atmospheric effects, as well as road-related mortality and barriers to animal movement, to population fragmentation and road avoidance behavior.
- There are effects of roads on major water quality parameters, namely: impacts on turbidity, total suspended solid (TSS), and total iron during construction, effects on chloride and sulfate during and after construction, and effects on acidity and nitrate after construction.
- During and after highway construction, the local air quality will be influenced by chemical pollutants such as "Volatile Organic Compounds" (VOCs) and "Nitrous Oxides" (NO_x) which will harm humans and animal species.
- There are substantial impacts on habitat losses for birds from new highway construction; fragmentation, disturbance, direct and indirect (habitat loss) mortality.
- Last but not least, there are effects of the Suncoast Connector on species biodiversity, as reduced flood zones will complicate biodiversity conservation and species resiliency.[9]

[9] Volk M.I., B.B. Nettles, and T.S. Hoctor, Vulnerability of the Suncoast Connector Toll Road Study Area to Future Storms and Sea Level Rise, University of Florida, April 2020.

1. Introduction[10]

In mid-May 2019, Governor Ron DeSantis signed CS/SB 7068: Transportation. The Suncoast Connector which will run from Citrus County to Jefferson County. Mentioned bill establishes three regional task forces to study Multi-use Corridors of Regional Economic Significance Programs within the Florida Department of Transportation (FDOT), which will be the state's most significant infrastructure-building project since the 1950's.

While these corridors are to address rural infrastructure needs across the state that not only adds toll roads but also addresses internet availability, the corridor task forces will stress collaboration and will be modeled after the Wekiva Parkway (State Road 429), which created much-needed regional road infrastructure while helping to protect the natural resources surrounding the Wekiva River.

The signing of this bill authorizes the creation of task forces that will focus on the advancement of construction in three identified infrastructure corridors. The corridors are Southwest-Central Florida Connector (Collier County to Polk County), Suncoast Connector (Citrus County to Jefferson County), Northern Turnpike Connector (northern terminus of the Florida Turnpike northwest to the Suncoast Parkway).

During the initial development phases, FDOT will appoint task force members for each corridor comprised of representatives from state agencies, environmental entities, and other stakeholders to evaluate and coordinate corridor analysis, environmental/land use impacts, and other pertinent impacts. The results of these analyses will be summarized in a report that is to be submitted to the Governor and the Legislature in October 2020. The bill also creates the construction workforce development program as a job development tool to address the current construction labor shortage and provides $2.5 million annually over the next three years to support the program.

The bill also outlines the need to address improve existing rural roadways, especially in the hard-hit communities impacted by Hurricane Michael, by increasing the annual allocation to the Small County Outreach Program (SCOP) and Small County Road Assistance Program (SCRAP).

[10] Based on the article "Suncoast Connector Could Come Through the Tri-County Area," Gilchrist County Journal, https://gilchristcountyjournal.net/2019/06/suncoast-connector-could-come-through-the-tri-county-area/

Tall Timbers' Position Statement

Tall Timbers' Position Statement,
Regarding the Proposed Suncoast Connector Toll Road.[11]

Background — Earlier this year, the Florida Legislature approved the construction of three toll roads that would span more than 300 miles across Florida. One of these roads is the Suncoast Connector Toll Road, which is proposed to extend more than 150 miles from Citrus County to Jefferson County in the Red Hills. The Red Hills region is one of the most ecologically significant areas of the Gulf Coastal Plain. Significant investments in private and public conservation efforts have protected over 40 percent (200,000 acres) of the Red Hills landscape. The Red Hills contains some of the last remnants of the nation's longleaf pine forests, numerous imperiled species, and critical water resources including the Floridan Aquifer and the watersheds of several designated Outstanding Florida Waters that feed into and protect highly productive Big Bend coastalwaters.

On its path northward, the proposed toll road would pass through the Big Bend counties of Levy, Dixie, Taylor, and Jefferson. These working rural communities comprise the core of the longest stretch of undeveloped coastline in the continental United States. The Big Bend also includes some of the most heavily forested areas in Florida's "wood basket," which in turn support the health of rivers, creeks, springs, and estuaries, protecting one of the world's most productive commercial and recreational fisheries on the Gulf Coast.

Concerns — Tall Timbers' concerns regarding the proposed Suncoast Connector Toll Road include:

1. *The proposed 150-mile toll road corridor will connect the Red Hills and Big Bend to Central Florida, encouraging sprawling development that will fragment or degrade private and public conservation lands and critical wildlife habitat. It will also limit the use of frequent prescribed fire, which is crucial to sustaining this diverse landscape.*

2. *The construction of the toll road corridor will affect the flow of freshwater across the extent of Florida's Big Bend, threatening the estuaries that are the lifeblood of Gulf fisheries. This proposal comes at the same time that state and federal governments are spending billions of dollars to restore the Everglades, which was severely impacted by similar manmade alterations of freshwater flows.*

3. *The proposed Suncoast Connector toll road will be a limited access roadway, which would require highway bypasses around existing rural communities potentially including Monticello, Perry, Cross City and Chiefland. This would reduce traffic to local businesses and negatively affect local economies throughout the US19 corridor.*

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[11] dd. Sept 17th, 2019

4. *US Highway 19 spans the entirety of the Big Bend. US19 is a substantially underutilized four-lane arterial roadway. Strategic reinvestment in US19 could cost-effectively improve north-south transportation, enhance community redevelopment, and protect sensitive natural resources that would be irreparably damaged by construction of a new toll road corridor through the Big Bend.*

The focus of these efforts should be on smart growth that protects the environment, enhances local economies, and preserves rural community character throughout the Big Bend.

Tall Timbers contracted with the Florida State University Center for Economic Forecasting and Analysis (FSU CEFA) to conduct an Economic Analysis study of Suncoast Connector Toll Road. The first step of the study involved a literature review relating to the impacts of toll road construction.

The literature review is divided into different sections, the general impact and local area impact studies, and the environmental studies on water, air, and biodiversity, respectively. Next, economic demographics and methodology will be presented, followed by an economic impact analysis and results. The economic impact analysis examined both the long-term impacts of bypassing the four primary towns along the projected Suncoast Connector route, and an analysis of impacted properties in the eight-county area. It is noted that none of the specifics on a planning trajectory concerning the Suncoast Connector construction is known as of yet, let alone specifics on cost. Therefore, the following economic analyses must be viewed as a rather preliminary attempt to map costs on this rather sizable project.

2. Literature Review Economic Impact

Literature Review (General Area)

One of the most classic macroeconomic inquiries is the effect of public capital investment on economic growth. While the benefits can and are still debated (as not all public capital investment spending is beneficial), the analysis of US economic history shows that at least under some scenarios public capital investment contributes to economic growth. One may come to mind are, e.g. the experiences of the New Deal, and the public infrastructure spending during the post-World War II era.

The US Federal Reserve economist D.A. Aschauer is generally considered to be the starting point of this line of research. According to Aschauer, there is a positive and statistically significant correlation between investment in infrastructure and economic performance. In particular, “a 1% increase in the labor-capital ratio brings forth an increase in the productivity of capital equal to 0.35%, while a 1% increase in the ratio of public to private capital stocks raises total factor productivity by 0.39%."[12] For his analyses, Aschauer used annualized data from 1949 to 1985, and a production function tool (as methodology) to derive his result, namely:

$$Y_t = A_t * f(N_t, K_t, G_t)$$

Where:
Yt = a measure of real aggregate output of goods and services of the private sector,
Nt = aggregate employment of labor services,
Kt = aggregate stock of nonresidential capital, and;
At = a measure of productivity or Hicks neutral technical change.
The variable Gt represents a flow of services from the government sector; for instance, assuming that the services of public capital are proportional to public capital, Gt may be taken as the public capital stock.

Given the results however, Aschauer (1989) already noted a significant "slump" of total factor productivity during the period 1971 to 1985 (citing various articles with potential alternate explanations, including; lower domestic growth in R&D expenditures, energy (oil) price shocks, halts in migrations from farm to non-farm, regional growth disparities,[13] and even aging of public infrastructure (where on all counts "no evidence was found")).[14] In further pursuit on the perceived "slump", Aschauer corroborates with findings by Munnell[15] in observing that the golden age of the 1950s and 1960s were partly due to the post-World War II substantial investment in core infrastructure (e.g., highways, mass transit, airports, water systems, electric/gas facilities). The subsequent drop in U.S. productivity growth, in the 1970s and 1980s, "may reflect the omission of public capital from calculation of inputs rather than a decline in technological innovation."[16]

These initial public capital investment findings, and overall general expectations on economic growth, were not met with most studies done after Aschauer. In fact, not only much lower impacts of public infrastructure spending were found, but a discussion also ensued on

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[12] p.182, Aschauer, D.A. (1989). "Is Public Expenditure Productive?" Journal of Monetary Economics 23 (1989), pp. 177-200. Retrieved from: https://www.scirp.org/(S(351jmbntvnsjt1aadkposzje))/reference/ReferencesPapers.aspx?ReferenceID=1984438https://www.sciencedirect.com/science/article/abs/pii/0304393289900470
[13] see a.o. p.161, Hulten C.R., and R.M. Schwab. (1984). Regional Productivity Growth in U.S. Manufacturing: 1951-78. The American Economic Review, Vol. 74, No. 1, pp. 152-162. Retrieved from: https://www.jstor.org/stable/1803315
[14] p.194-197, Aschauer (1989).
[15] Munnell, A.H., (1990). "Why has productivity growth declined? Productivity and public investment," New England Economic Review, Federal Reserve Bank of Boston, issue Jan, pages 3-22. Retrieved from: https://ideas.repec.org/a/fip/fedbne/y1990ijanp3-22.html
[16] p.32, Aschauer D.A., (1990). "Why Is Infrastructure Important?" Paper presented to a conference of the Federal Reserve Bank of Boston at Harwich Port, Massachusetts. Retrieved from: https://www.bostonfed.org/-/media/Documents/conference/34/conf34b.pdf., and p.19 Munnell (1990).

the specific conditions to be met for public infrastructure spending to be beneficial. Some noteworthy studies were conducted by e.g. Fogel (1964), Gramlich (1994), Heckelman and Wallis (1994), Rephann and Isserman (1994), Rivers and Heaney (1995), and Cain (1997), to name but a few. Fogel estimated the private rate of return on the Union Pacific Railroad at 11.6%.[17] Gramlich indicates that the real rate of return on highway investment is 35 percent on maintenance of current highways, 15 percent on new urban construction projects, 5 percent on rural construction projects, low on new construction projects and even negative on fixing highways above minimum standards. To his perception therefore, even without further new construction, the investment in the maintenance of the core infrastructure is still very profitable.[18] Heckelman and Wallis (1994) estimated that, between 1850 and 1910, the first 500 miles of railroad track laid in a given state led to significant increases in property values. They calculated the revenue gain from the land appreciation to be $33,000-$200,000 per mile, while construction costs were $20,000-$40,000 per mile. On average, therefore, the revenue from construction of a new railroad outweighs the costs. The gains, however, sharply diminish after the initial 500 miles.[19] In their paper, Rephann and Isserman (1994), examine the effectiveness of highway investment as an economic development tool. They find that the beneficiaries of the interstate links in terms of economic growth are interstate counties in close proximity to large cities or having some degree of prior urbanization, such as a city with more than 25,000 residents. Rural interstate and off-interstate counties exhibit few positive effects.[20] Rivers and Heaney found that "the links identified in national level studies between infrastructure and economic development" are also present locally.[21] The research team notes here that the links may be there but the levels are markedly different as will be summarized below. According to an overview of multiple studies by Cain (1997), historically most infrastructure investments have been profitable. More contemporary

[17] Fogel, R.W., The Union Pacific Railroad: A case in premature enterprise (The Johns Hopkins Press, Baltimore), 1960., and
Fogel, R.W., Railroads and American economic growth: Essays in econometric history (The Johns Hopkins Press, Baltimore), 1964.
[18] p. 1184, citing a table from CBO (1998), and Gramlich, E.M., 1994, Infrastructure investment: A review essay, Journal of Economic Literature, September. Retrieved from: https://www.jstor.org/stable/pdf/2728606.pdf?refreqid=excelsior%3Ac727417b6290b634ec1d16d426c6247c
[19] Heckelman, J.C. and J.J. Wallis, (1994), Railroads and Property Taxes, Explorations in Economic History, Paper prepared for the Eleventh International Economic History Congress, Milan, Italy, September (1994). Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/S0014498396906646
[20] p.1, Rephann T., and A. Isserman, (1994), New Highways as Economic Development Tools: An Evaluation Using Quasi-Experimental Matching Methods. Regional Research Institute, West Virginia University. Elsevier, Volume 24, Issue 6, pp 723-751. Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/0166046294900094
[21] p.69, Rives J.M., and M.T. Heaney, (1995), Infrastructure and Local Economic Development. Regional Science Perspectives, Vol. 25, No. 1, 1995. Retrieved from: http://michaeltheaney.com/wp-content/uploads/2014/01/Infrastructure.pdf

studies, according to Cain, suggest a strong but indirect effect on private economic activities.[22]

Given the diverse nature of the many reports, both to economic impact and the specific conditions (and to which must be added differences in methodologically), the OECD (2002) called for further structuring of analysis. They state that: "The belief that transport infrastructure projects have significant impacts on the development of regional economies has often been used to justify allocating resources to transport infrastructure investment. However, the clear meaning of these impacts or how they could be evaluated has yet to be established."[23] They advocate a Cost Benefit Analyses (CBA) methodology, with Direct user benefits and Socio-economic spillovers, namely:

- ***Accessibility*** (to improve the accessibility of a given region by reducing travel time or increasing the potential to travel)
- ***Employment*** (both created and relocated jobs)
- ***Efficiency*** (time and cost savings as well as gains in accessibility and reliability, arising from the transport infrastructure would allow productivity gains to be achieved by improving their production and distribution)
- ***Social inclusion*** (projects could either result in further exclusion of such communities or could contribute to addressing the problem of social exclusion by improving accessibility and mobility)
- ***Environment*** (external effects on the environment)

It is noted here that the OECD observes that improved infrastructure can not only attract development into an area, it can also draw it out. In all, they recommend a major research effort with a view to improve our understanding of the issues (spillovers) raised.[24] In a similar sense, Snieska and Simkunaite (2009) suggest a more precise definition of infrastructure.[25]

Of interest is also a study done by the Federal Reserve Bank of San Francisco (2012): "Roads to Prosperity or Bridges to Nowhere?"[26] They examine the dynamic macroeconomic effects

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[22] p.136, Cain L.P., (1997), Historical perspective on infrastructure and US economic development. Regional Science and Urban Economics. Volume 27, Issue 2, April 1997, Pages 117-138. Website: https://doi.org/10.1016/S0166-0462(96)02148-5

[23] p.7, OECD, (2002), Impact of Transport Infrastructure Investment on Regional Development. Retrieved from: https://www.itf-oecd.org/sites/default/files/docs/02rtrinveste.pdf

[24] p.10-11, OECD (2002).

[25] Snieska V., and I. Simkunaite. (2009), Socio-Economic Impact of Infrastructure Investments. Article in Engineering Economics. Retrieved from: https://www.researchgate.net/publication/228343953_Socio-Economic_Impact_of_Infrastructure_Investments =

[26] Leduc S. and D. Wilson. (2012) Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on the Impact of Public Infrastructure Investment, Federal Reserve Bank Of San Francisco Working Paper Series, Working Paper 2012-04, April 2012. Website: http://www.frbsf.org/publications/economics/papers/2011/wp12-04bk.pdf

of public infrastructure investment both theoretically and empirically, using a novel data set they compiled on various highway spending measures. They found that "shocks to federal highway funding has a positive effect on local GDP both on impact and after 6 to 8 years, with the impact effect coming from shocks during (local) recessions. However, they found no permanent effect (as of 10 years after the shock)."[27]

In a more recent study, Bourne (2017) concludes that "finding the case for more government investment is significantly weaker than commonly asserted." He "suggest alternative means of improving infrastructure development."[28] Similarly, Schmitt (2017), in her article "Is Infrastructure Spending Good for the Economy? It's Complicated",[29] states that "Job creation is no slam dunk", and "spending on infrastructure can easily be wasted."

A rather usefully recent literature review was conducted by Pender and Torero (2018). It presents a review on the impacts, costs, and benefits of infrastructure in the United States (and in developing countries). Next to an oversight of different methodologies used in analyses, such as Input-Output (IO) analyses, Marginal Rates of Return, and Cost-Benefit studies, amongst others. The studies reviewed (note: as far as the US is concerned) show a wide range of estimates of the output elasticity of public capital, ranging from -0.49 to +0.56, with a mean value of 0.12 (12 percent).[30] They note that "the range of estimates depends on the unit of analysis, the type of public capital, and the method of analysis. Generally larger productivity impacts were found in national than in state-level studies, and for water and sewer capital, than for highway capital. Smaller impacts were found in studies that controlled for state-level fixed factors that affect productivity. These estimates imply an even wider range of estimates of the marginal rate of return to public capital stocks, ranging from close to zero for highway stocks to nearly 90 percent for water and sewer capital."[31] Under the IO model literature reviewed, they find fairly consistent yield predictions about the employment impacts of infrastructure investment, with national total employment impacts generally in the range of 14,000 to 28,000 jobs per $1 billion ($1B) invested. It is observed that, employment multipliers vary by type of infrastructure and region and tend to be smaller in smaller regions. They quote Heintz et al. (2009), with estimates that each $1B in infrastructure investment generates about 18,000 jobs on average, DeVol and Wong (2010) whom produce average employment multipliers (across all investments) of about 25,000 jobs per $1B investment, Berkman et al. (2010) with 10,400 to 13,200 jobs per $1B for statewide impacts, and Kuttner (2016) with 69,600 jobs per $24.1B investment (which is linear amounts to: 2,887 jobs per $1B). In addition to Pender and Torero (2018), Bivens (2017) mentions that each $100 billion in infrastructure spending would boost job growth

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[27] p.3 and p.40, Leduc, and Wilson (2012)
[28] i.e. CATO Institute on p.1.
[29] Schmitt (2017)
[30] On output elasticity, Pender, and Torero (2018) use: *Marginal rate of return = Output elasticity of capital stock x (Output/Capital stock ratio)*
[31] p.*i*, Pender, and Torero (2018)

by roughly 1 million full-time equivalents (FTEs), which taken linearly amounts to 10.000 FTE per $1B. According to local IMPLAN multipliers $100 billion in infrastructure would yield between 7,780 and 13,319 FTE's depending on the specific nature of infrastructure investment.[32] Highway, Street, and Bridge Construction would similarly yield 8,457 FTE's. Back to the Pender and Torero review paper (2018), on the benefit-to-cost ratio (BCR) of public capital stocks estimated, they note that in the studies reviewed the ratio ranges from "about 0.3 to greater than 2.0, depending on the assumptions of the econometric framework."[33] Finally, another important note from their literature review is that "the mean annual rate of return to highway capital across state-level studies was close to zero."[34]

Lastly to mention here is a recent report by the Council of Economic Advisers (2018), with an assessment upon likely impacts of a $1.5 trillion program of infrastructure investment. In its report, the CEA estimates that a 10-year, $1.5 trillion program of infrastructure investment:

- Could add between 0.1 and 0.2 percentage point to average annual real growth in gross domestic product (GDP), and;
- Would likely result in the employment of 290,000 to 414,000 additional infrastructure workers.[35]

The CEA indicates that: "An increased stock of public sector capital would mean increased flows of capital services available to the economy's workers, fueling GDP growth through at least two channels. First, by raising the productivity of other factors of production (labor, private capital, and land), increased public capital services encourage firms to increase their own investments and expand economic activity. This indirect, or crowding in, effect has been identified in numerous studies. A second, direct effect works through increases in public capital services per employee hour, or public capital deepening, which typically accounts for between 0.05 and 0.20 percentage point of growth in labor productivity."[36] In reference to CBO (2016)[37] and recent CEA (2016) estimates[38] of 8 and 14 percent real marginal product respectively, they prefer a new updated marginal product of 12.9 percent, based on Born and

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[32] IMPAN multipliers, un-weighted averages over the counties within the potential Suncoast Connector trajectory.
[33] p.*iv*, Pender, and Torero (2018)
[34] p.*iv*, Pender, and Torero (2018)
[35] The CEA notes however that on average, over a 10-year window, these employment gains may be offset by losses elsewhere in the economy. In addition, it notes that the average time needed to complete final Environmental Impact Statements (EIS) reached 5.1 years for EIS completed in 2016.
Council of Economic Advisors (CEA), (2018), The economic Benefits and Impacts of Expanded Infrastructure Investment. Retrieved from: https://www.whitehouse.gov/wp-content/uploads/2018/03/The-Economic-Benefits-and-Impacts-of-Expanded-Infrastructure-Investment.pdf
[36] p.8, CEA (2018)
[37] Congressional Budget Office (CBO), 2016, "The Macroeconomic and Budgetary Effects of Federal Investment." Retrieved from: https://www.cbo.gov/publication/51628
[38] Council of Economic Advisers (CEA), 2016, "Chapter 6: The Economic Benefits of Investing in U.S. Infrastructure." Economic Report of the President. Retrieved from: https://obamawhitehouse.archives.gov/administration/eop/cea/economic-report-of-the-President/2016

Ligthart (2014).[39,40] This where CEA define public infrastructure investment under as: "all sectors falling under NAICS 3-digit code 237000, including utility system construction along with highway, street, and bridge construction, other specialty trade contractors (NAICS code 238900), and remediation and other waste management services (NAICS code 562900), including former industrial site cleanup."[41] The CEA results, as mentioned, are based on real marginal product / marginal return estimates, or:

$$output\ elasticity = (marginal\ product\ of\ public\ capital) * (public\ sector\ capital\ intensity)$$

or:[42]

$$\varepsilon = \left(\frac{dQ}{dK}\right) * \left(\frac{K}{Q}\right)$$

Given that the analysis of the program is scalable, larger, or smaller programs (with similar timing) would be expected to generate proportionally larger or smaller impacts on GDP. One serious caveat CEA mentions is: "a significant change in nonfederal resources may affect interest rates and crowding out, since States and localities typically rely more heavily on budget-neutral funding plans for infrastructure."[43]

In rounding up this short review, the research team provides the Table 1, with estimated Marginal Return rates to different types of public capital investments and adjacent notes, taken from Pender and Torero (2018).[44] From the table it is taken that the "Highway capital" category marginal rate of return is significantly lower on the local level as compared to the National level. The marginal returns on the highlighted categories shown will serve as a broad and indicative indicator, as compared to later findings.

[39] Bom, P. and Ligthart, J., (2014), "What Have We Learned from Three Decades of Research on the Productivity of Public Capital?" Journal of Economic Surveys 28(5): 889–916. Retrieved from: https://ideas.repec.org/a/bla/jecsur/v28y2014i5p889-916.html

[40] Without detailed scrutiny on the various definitions in the literature reviewed, the 12.9 percent seems to fall in line with the 12 percent mentioned by Pender and Torero (2018).

[41] p.24, CEA (2018).

[42] i.e. $\frac{\varepsilon}{\frac{K}{Q}} = \left(\frac{dQ}{dK}\right)$, or with output elasticity estimate of 0.083, and the ratio of nondefense public fixed assets to annual nominal GDP being 0.645, or (0.083/0.645) = 0.129 or 12.9%

[43] p.9, CEA (2018).

[44] p.41, Pender, and Torero (2018).

Table 1. Estimated Marginal Returns to Different Types of Public Capital / Capital[45]

Marginal Returns to:	National	State
Total nondefense public capital	0.374	0.053
- With state fixed effects or first differences		-
- Without state fixed effects or first differences		0.223
Core public capital (highways, mass transit, airports, electrical and gas facilities, water, and sewer)	0.971	
Highway capital	0.675	0.026
- With state fixed effects or first differences		-
- Without state fixed effects or first differences		0.203
Water and sewer capital		0.881
- With state fixed effects or first differences		0.834
- Without state fixed effects or first differences		1.328
Other state and capital (buildings, other structures, equipment)		-
- With state fixed effects or first differences		-
- Without state fixed effects or first differences		0.111

Source: Economic research Services (ERS) analysis, and Bureau of Economic Analysis; Fixed Reproducible Tangible Wealth, years 1929 – 1995.

From the Economic literature reviewed, it is summarized that:

- Public capital projects used to have significant higher economic impacts then similar projects nowadays have (i.e. declining role of, or diminishing returns from, additions to infrastructure in the present economy).
- Public capital projects have greater economic impact on the Federal level than they do on State, and ultimately, County levels (which may be due to leaks of impacts outside smaller defined areas).
- Typically, newer public capital projects have greater economic impact than repairs or even upgrades.

[45] Source: Economic Research Services (ERS) analysis, based on mean output elasticities in Table 2 and Bureau of Economic Analysis, Fixed Reproducible Tangible Wealth, 1929 – 1995 (https://www.bea.gov/scb/account_articles/national/0597niw/table1.htm)
Notes with the table: Estimates based on the formula: Marginal return = output elasticity x (ratio of private sector output to nondefense public capital stock)/(ratio of capital stock considered to nondefense public capital stock in 1985).
Ratio of private sector output to nondefense public capital stock assumed to be 1.41, based on the midrange of estimates of marginal returns reported in Aschauer (1990).
Ratio of core public capital stock to nondefense public capital stock in 1985 = 0.53; ratio of total highway capital stock to nondefense public capital stock in 1985 = 0.33; ratio of state and local highway stock to nondefense public capital stock in 1985 = 0.32; ratio of water and sewer capital stock to nondefense public capital stock in 1985 = 0.12, ratio of other state and local capital stock to nondefense public capital stock in 1985 = 0.076.

Literature Review (Local Area)

Transportation development projects, highways in particular, come with positive and negative local externalities. Urban economic theory posits that highway improvements influence urban growth patterns through land prices. If highways improve accessibility, that accessibility premium will be reflected in higher land prices, and ceteris paribus, higher house prices.

Boarnet et al (2001)[46] examines the impact of construction of toll roads on house pricing in Orange County, California, this both in the Foothill Transportation Corridor Backbone (FTCBB), and the San Joaquin Hills Transportation Corridor (SJHTC). The analyses done provides evidence that indeed the construction of the first two portions of the Orange County toll-road network created accessibility premiums that were reflected in home sales prices. The same analyses however did not prove as strong for the SJHTC, which the author suggests is caused by other factors correlated with distance from the road. Vadali (2008)[47] examines the impacts of toll roads in a major metro area, namely, Dallas County, Texas, on property values. He concludes that: accessibility benefits are capitalized at optimal distances from the tollway, the optimal distance being in the 0.25 to 1-mile range for detached housing, this both before and after the opening of a tollway. Figures 1 and 2 show the accessibility premiums over the years of analyses.

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[46] Boarnet, M.G., and S. Chalermpong, (2003), "New Highways, House Prices, and Urban Development: A Case Study of Toll Roads in Orange County, CA, *University of California at Irvine*, 2003. Retrieved from: https://escholarship.org/uc/item/2zd554cs

[47] Vadali, S., (2008), Toll roads and economic development: exploring effects on property values", The Annals of Regional Science, (2008) 42: 591. https://doi.org/10.1007/s00168-007-0180-0

Figure 1. House Price Indices in FTCBB Corridors

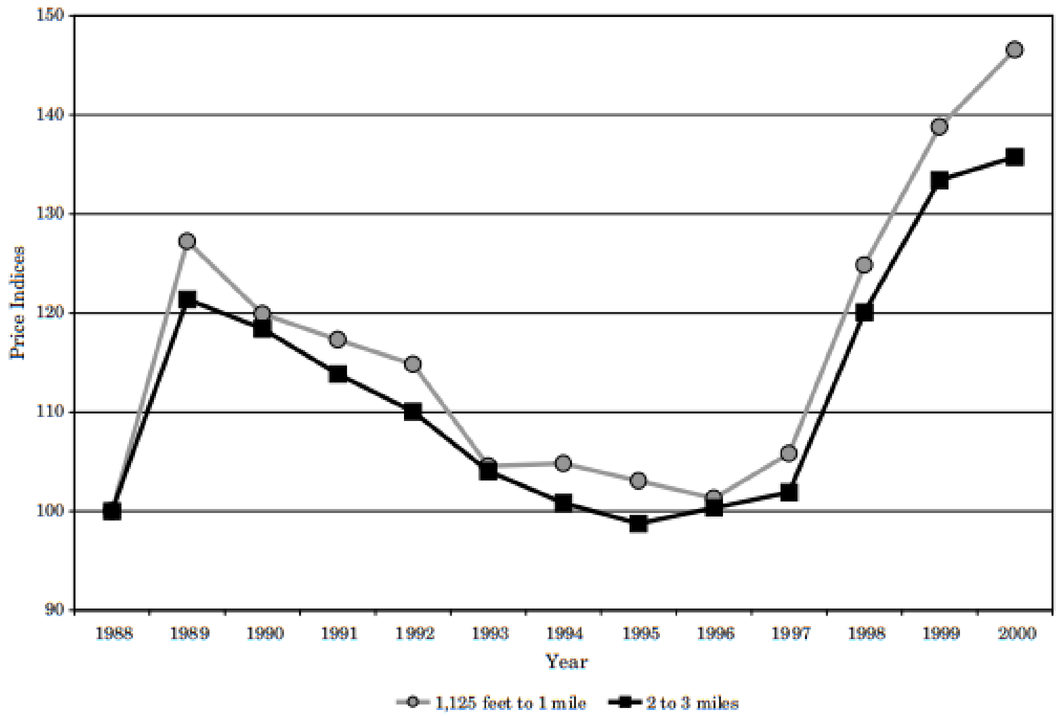
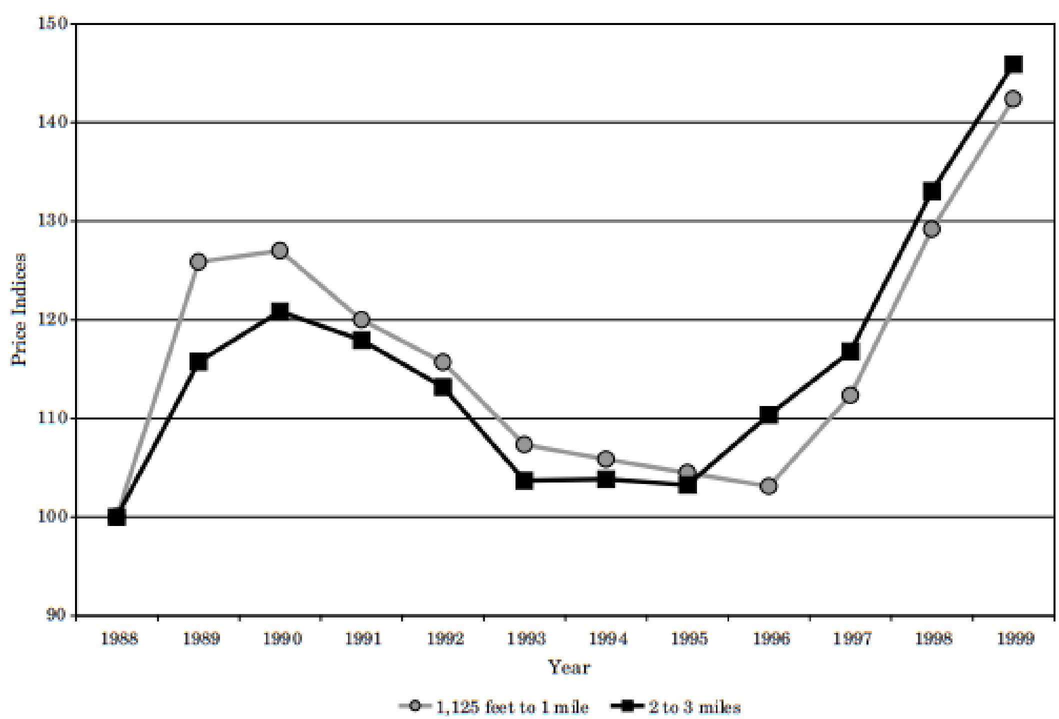


Figure 2. House Price Indices in the SJHTC Corridors



An interesting (and well sourced) analyses is conducted by Levkovich et al (2016),[48] whom next to positive accessibility premiums, also include negative externalities (i.e. levels of exposure to traffic intensity, and noise pollution). The empirical study is done on two highway projects (A50 and A30), in the Netherlands. Their results show:

a) The new highways increased the housing value in the surrounding residential area by approximately 2.5 - 4.3 percent, with even higher price increases by a rate of approximately 5 % before the highways were completed.
b) After the completion of the projects, the negative effects of increased traffic and noise pollution become apparent, which is reflected in lower values.
c) Houses that were sold during the four years prior to the completion of Highway A50 gained approximately 9 % in value, whereas housing transaction (ibid four years prior) along the A30 were approximately 4 % lower in value, implying a negative anticipation effect.

Next, the same authors provide direct estimations of each of the three externalities mentioned, namely:

- The estimated elasticity between transaction price ratios and changes in accessibility levels is approximately 1.76, which means that a change of 1% in accessibility levels is expected to result in a 1.76 % increase in the transaction price ratio.
- The estimated coefficient for changes in traffic density levels is estimated at approximately -0.0298, implying that properties located within 1 km of a new interchange have experienced a decline of approximately 3 % in value.
- The noise pollution coefficient is also estimated to be negative and statistically significant at -0.0360, indicating that properties in this range have experienced a decline of 3.6 % in value (noise defined at ≤ 300 m from the highway).

Unfortunately, no weights on the three externalities are provided, but the authors state that that improvement in accessibility is the dominant effect resulting from the development of the highways.

Relating to economic impacts of highway bypasses on small towns, Babcock (2003)[49] uses both regression analyses and a questionnaire, to measure impacts on (1) total employment of bypass towns, (2) retail sales of the towns' travel-related businesses, (3) employment of the towns' travel-related businesses, and (4) the bypass town as a whole. The statistical results (on question 1), shows that the bypasses did not have a statistically significant effect on total employment of the bypass towns. The other questions were analyzed via a

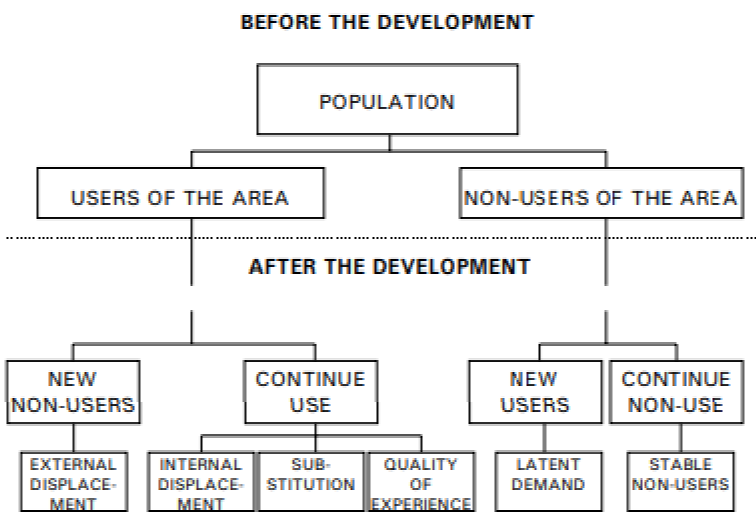
[48] Levkovich, O., Rouwendal, J. & van Marwijk, R., (2016), "The effects of highway development on housing prices", Transportation 43: 379. https://doi.org/10.1007/s11116-015-9580-7

[49] Babcock M.W., and J.A. Davalos, (2010), "Case Studies of the Economic Impact of Highway Bypasses in Kansas", Journal of the Transportation Research Forum. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.353.4113&rep=rep1&type=pdf

questionnaire (n=54 businesses). Without going into detail and breakouts on the different questions, from the overall conclusion: "About three-fourths (76%) of the firm representatives thought their retail sales would have been higher in the 1999- 2001 period if the bypass had never opened. About half the business owners and managers thought their company's employment would have been higher in the 1999-2001 era in the absence of the bypass. A large majority (67%) of the firm representatives thought the bypass had a negative impact on the town as a whole."[50]

Externalities, or impacts of major road developments on tourism (in Norway), was the topic of a paper by Teigland (1999).[51] Among the effects that were identified are changes in a) latent and effective demand, and b) displacement and substitution, and the interaction and/or cumulative effects. Although not an analytic paper, in addition to his objective to provide concepts and methods that can be used in impact analyses, he does provide some case study and survey driven impact results. The conceptual framework used in the paper is depicted in Figure 3.[52]

Figure 3. Types of Effect on Recreation Consumers from Projects that Change Nature Settings



Findings include:

- Impacts on the tourist and recreation industry: only a small percentage of the tourists driving private cars did take a few hours' detour to take a closer look at the attractions. The average braking effect was a three-minute stop along the road. The

[50] p. 23 Babcock (2013).
[51] Teigland J., (1999), Predictions and realities: impacts on tourism and recreation from hydropower and major road developments, Impact Assessment and Project Appraisal, 17:1, 67-76, DOI: 10.3152/147154699781767972. Retrieved from: https://doi.org/10.3152/147154699781767972
[52] p. 68 Teigland (1999).

few car-travelling tourists who did make a detour, stayed overnight more often along the new road than other through-travelers.

- Latent or secondary demand effects: the new road did not release a strong latent demand for outdoor recreation, as most tourists drove directly through. Of the people who stopped their vehicle, 80–85% stayed by the car, making only a short rest (to get fresh air and so on). Only 5–10% of them walked more than 1 km away from the road. The new road, therefore, have not released many new day-tourists.
- Displacement effects among traditional users: The volume of traditional recreation use changed considerably: i.e. by 50%, a decline not found in the two reference areas. The strong decline may be interpreted as an external displacement effect of the development when earlier users were transferring their activity to other areas. The total displacement effect measured in recreation days, therefore, may be as high as 60–65% during the mid-1970s. The volume however, has increased substantially again since the mid-1980s.

The interaction and cumulative effects are therefore U-shaped over time and in volume. The author acknowledges that this raises several important questions, but answers unfortunately remain "hanging".

A recent paper by Kukkapalli (2018),[53] focusses on the effect of road construction projects before, during, and after the construction to improve mobility of people and goods. Results vary according to the three different types of road construction projects. In general though, the widening and resurfacing projects have larger effect on travel time measures. It is noted that the speed limit, along a particular section of interest, was 65 mph before the construction, while the speed limit after the construction was complete is 70 mph (a result of both initial short-term gains in eased traffic flows or increased speed, and subsequent displaced or induced traffic). The findings fall in line with case studies in the UK and the Netherlands that the benefits from reduced congestion and shorter journey times are often short lived as new road network capacity is taken up by induced traffic growth (Matson et al., 2006).[54]

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[53] Kukkapalli V.M., and S.S. Pulugurtha, (2018), Effect of Road Construction Projects on Travel Time Reliability, International Conference on Transportation and Development. Retrieved from: https://ascelibrary.org/doi/10.1061/9780784481547.005

[54] Matson L., I. Taylor, L. Sloman, and J. Elliott. (2006). Beyond traffic infrastructure: lessons for the future from recent road projects, Final report for the CPRE and the Countryside Agency. Retrieved from: http://www.cpre.org.uk/resources/transport/roads/item/3113-beyond-transport-infrastructure

From the papers listed above, the research team briefly summarized that:

- Accessibility premiums will be reflected in higher land prices, and higher house prices, but beware of the pre-project anticipation (which may be negative pushing the initial index (=100) in Figures 1 and 2), as well as other negative externalities.
- Highway-bypasses will impact local businesses (i.e. the local economy will undergo structural changes). Tourism-oriented businesses will especially be impacted, where also a U-shape adaptation seems applicable, with phasing stretching over a decade.
- The scant data on pre- versus post- highway construction, in particular, road widening, seems to suggest a relatively small gain in travel speed.

3. Ecosystem Impacts

Background on the Potential Ecological Impacts of the Proposed Suncoast Connector Toll Road

During the time period that FSU CEFA was working on this project, another study was published and released by the University of Florida in 2020 on the potential ecological impacts of the proposed Suncoast Connector Toll Road. The research study team will briefly summarize the UF findings below.

The authors found that: "This assessment of relevant GIS data on focal species, natural community, wildlife corridor, surface water resources, ground water resources, forest resources, and existing and proposed conservation lands shows that a new toll highway including a modified US19 corridor to accommodate a new highway would have very significant impacts on the ecological resources of what is currently one of the most rural regions with highest ecological integrity in Florida. There is no way to build a new or modified highway facility crossing most of this region without very significant impacts including to the habitat and wildlife corridors needed to support fragmentation-sensitive species, allow for coastal adaptation to sea level rise, maintain functional surface water hydrology for the many significant river systems, including the Suwannee River, that play an essential role in the ecological integrity of the coastal estuary of the Big Bend, which includes one of the biggest sea grass waterscapes in the United States. The study area also includes some of the most important areas of recharge and protection of the Floridan Aquifer in the state, and a new highway and facilitated development could lead to additional significant impacts to the already endangered Florida Aquifer.

The study area also includes essential portions of the Florida Ecological Greenways Network (FEGN), which is the official state plan (administered by the Florida Department of Environmental Protection) for protecting a statewide system of wildlife corridors. The Big Bend region includes prominent areas of the highest priorities in the FEGN, called Critical Linkages, as well as other high priorities that would be significantly threatened by a new highway and associated development traversing this area.

…….Given the high level of potential ecological impacts and the impossibility of avoiding impacts, any plan to move forward with assessing the feasibility of any new highway, including the consideration of alternative routes, must take into account the high level of impact, with the likelihood that the no build scenario being most compatible with achieving the conservation and resource-based (including forestry and recreation) economic goals of this nature-dominated region…. "

In final summary the authors conclude: "This analysis of the Suncoast Connector study area shows that any potential new highway would have very significant adverse impacts to one of the more rural, biodiverse, and ecologically functioning regional landscape remaining in Florida."[55]

Background on Other Ecosystems Impacts Concerning Road Construction Projects

Ecosystem externalities of road construction projects are evident. This section of the report will fall short on all literature available, let alone the ecosystems diversity along the trajectory of the Suncoast Connector, and therefore must be seen as a preliminary attempt only (also given the time-constraint of this project). In particular, this section of the literature review focuses on the ecosystem impact of road construction. The ecosystem impact separated into two parts: wildlife and pollution.

Carr and Fahrig (2001)[56] pose that highly vagile[57] organisms may be at a disadvantage in landscapes with roads due to reduced population sizes (traffic mortality or roadkill) and reduced movement between complementary resources (notably smaller patches and increased patch isolation). Their analyses results suggest that traffic mortality can cause population declines and that more vagile species may be more vulnerable to road mortality than less vagile species. Similarly, Koemle et al. (2018)[58] pose that fragmentation and destruction of ecosystems due to highways are key threats to habitat quality and biodiversity. Their analyses results indicate that a growing highway density leads to decreasing populations of roe deer and wild boar in their local district, contrasted with increasing populations in neighboring districts. Red deer populations were relatively insensitive to highway construction. Positive population effects, on the other hand, in neighboring districts are explained by the reduction of competition, disease transmission, and roadkill.

[55] Hocker, T.S., and M. Volk, (2020). Potential Ecological Impacts of the Proposed Suncoast Connector Toll Road, pp.2-3 and pp. 71.
[56] Carr L.W., L. Fahrig, (2001), Effect of Road Traffic on Two Amphibian Species of Differing Vagility, Conservation Biology, pp. 1071-1078, Volume 15, No. 4. Retrieved from: https://pdfs.semanticscholar.org/057e/83b420c2dc26b44641dc07cb07b53fc6ab6c.pdf?_ga=2.165060921.700263744.1579885695-2042015450.1574700087
[57] Vagility here is defined as "the inherent power of movement possessed by individuals", which the authors prefer over dispersal distance/capability because it encompasses both movement distance and movement frequency.
p. 1071 Carr and Fahrig (2001).
[58] Koemle D., Y. Zinngrebe, and X. Yu, (2018), Highway construction and wildlife populations: Evidence from Austria, Land Use Policy, Volume 73, Pages 447-457. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0264837717313133

Coffin (2007)[59] presents an overview of the literature describing the various ecological effects of roads, and the development of road ecology. Focus in the article is threefold, namely:

1) effects of roads on the abiotic components of ecosystems, including changes to hydrology and water quality (incl. mechanisms of sediment erosion and debris transport, and chemical pollutants), as well as noise and other atmospheric effects,
2) effects of roads on biotic components of ecosystems, from the direct effects of road related mortality and barriers to animal movement, to population fragmentation and road avoidance behavior, and finally,
3) fragmentation of landscapes, and the more complex cumulative ecological effects of roads when considered as networked systems.

For pollution, several papers are reviewed on each topic. Focus will first be on water pollution, next on land pollution, and finally on biodiversity.

Water Pollution

Water quality is affected by the pollutants present in road construction, surface runoff and the atmosphere. More seriously, it could be transported long distances. In other words, the pollution will affect widely.

Chen and Viadero (2009)[60] analyze the effects of the highway construction on water quality and biological conditions in the Lost River watershed, northeastern West Virginia. Research questions addressed in their study include:

(i) Are there any effects of highway construction on stream water quality during and after construction?
(ii) Are there any effects of highway construction on stream benthic macroinvertebrates index scores during and after construction?

Their analyses show that highway construction had statistically significant effects on seven major water quality parameters identified by principal component, namely: impacts on turbidity, total suspended solid (TSS), and total iron during construction, effects on chloride and sulfate during and after construction, and effects on acidity and nitrate after construction. In addition, highway construction had statistically significant impacts on the scores of stream benthic macroinvertebrates index after construction but did not change the

[59] Coffin A.W., (2007), From Roadkill to Road Ecology: A Review of the Ecological Effects of Roads, Economics. Retrieved from: https://www.semanticscholar.org/paper/From-roadkill-to-road-ecology-%3A-a-review-of-the-of-Coffin/1008a5a8e9efb62aee25261743f20162656e3c77
[60] Chen Y., R.C. Viadero, a.o. (2009), Effects of Highway Construction on Stream Water Quality and Macroinvertebrate Condition in a Mid-Atlantic Highlands Watershed, USA; Journal of Environmental Quality 38:1672–1682. Retrieved from: https://pdfs.semanticscholar.org/2f1d/4417bc2f8cf5dad61a8ed844b186181e6ede.pdf

overall good biological condition. The results support the conclusion that detection of highway construction impacts on stream chemical conditions may require long-term monitoring.

Air Pollution

During and after the high-way construction, the local air quality will be influenced by chemical pollutants such as Volatile organic compounds （VOCs) and nitrogen oxides (NO_x) which will harm humans and species. Also, vehicle emissions, resuspended particles from the traffic flow, dust, and other emissions should be of concern.

Roberts et al (2010) [61] present an extensive case study assessing activity, emissions, and air quality impacts associated with construction to widen SR-92, a two-lane highway in Arizona.[62] Although the study focused on assessing particle matter (PM) less than 2.5 microns in diameter ($PM_{2.5}$), the research program yielded insight into other pollutants related to construction activities, including larger particles (PM_{10}), carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NO_x, NO, and NO_2), and black carbon (BC). The study results indicate that construction work did affect near-field PM_{10} concentrations. The predominant contributor to these impacts was fugitive dust, as opposed to exhaust emissions. The study results also indicate that construction work did not substantively affect near-field $PM_{2.5}$ concentrations.
In total, year-2009 construction activity at the SR-92 project produced 7,043 kg of PM_{10}, 1,461 kg of $PM_{2.5}$, and 7,102 kg of NO_x. Fugitive dust accounted for 92% of the total PM_{10} emissions associated with construction activities, and 63% of the total $PM_{2.5}$ emissions (NB these figures do not include on-road or traffic vehicle emissions). On an average day in 2009, construction activity at the SR-92 project produced 29 kg of PM_{10}, 6 kg of $PM_{2.5}$, and 30 kg of NO_x. In comparison, to the National Ambient Air Quality Standards (NAAQS) for PMs, these emission estimates fell within the bounds of alternative emission estimates produced using the U.S. Environmental Protection Agency's (EPA) NONROAD model.

Font et al., (2014) [63] made use of a road widening project in London to investigate the impact on ambient air quality (particulate matter, NO_X, and NO_2), during and after the completion of the road works. PM_{10} increased during the construction period up to 15 $\mu g\ m^{-3}$ during

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[61] Roberts P.T., S.B. Reid, D.S. Eisinger, a.o., (2010), Construction Activity, Emissions, and Air Quality Impacts: Real-World Observations from an Arizona Road-Widening Case Study, Prepared for Beverly Chenausky Arizona Department of Transportation. Retrieved from: https://rosap.ntl.bts.gov/view/dot/20268

[62] The study was sponsored by the Arizona Department of Transportation (ADOT).

[63] Font A., T. Baker, a.o., (2014), Degradation in urban air quality from construction activity and increased traffic arising from a road widening scheme; Science of the Total Environment, 497-498, pp. 123-132. Retrieved from: https://reader.elsevier.com/reader/sd/pii/S0048969714010900?token=6BEC0CF63DB2ED4DC41F80972AE1F7DD78BBB499EBEA990A2CCEA7EC65E149DAE8B37F228F212A750F37B4AF4EF59A4A

working hours compared to concentrations before the road works. The median emission factor was estimated at 0.0022 kg PM_{10} m^{-2} $month^{-1}$, with peaks activity emissions at six times that amount. After the completion of the widening however, there was an increase in all pollutants from the road during rush hour. These increased air pollution indices were associated with an increase in the number of cars, taxis, and light goods vehicles (LGVs).

Biodiversity

Jacobson (2005)[64] pints to a substantial impact on the habitat losses for birds from new highway construction. In the paper, several threats to birds created by the new highway outlays are specified, amongst others; 1) fragmentation (habitat dissection, and isolation), 2) disturbance (noise and sound), 3) the direct mortality e.g. walking birds, water birds, and owl, and 4) indirect mortality due to habitat loss, habitat sinks, predator bridges, brood parasitism, noxious species, lethal structures, et cetera. It is recommended that protective measures, as well as other innovative solutions, should be attempted especially along certain highly vulnerable locations.

A recent estimate on bird-vehicle collision mortality is provided by Loss et al. (2014).[65] Using four models they found considerable variation among annual median mortality estimates as shown in Table 2.

Table 2. Estimates of Annual Bird-Vehicle Collision Mortality on U.S. Roads

	Total mortality (millions)		Mortality per km	
Mortality data used	Median	95% CI	Median	95% CI
United States	145.7[a]	61.9–274.6[a]	36.0[a]	15.3–68.0[a]
	197.1[b]	78.2–397.9[b]	48.8[b]	19.4–98.5[b]
United States + Europe	171.0[a]	59.6–381.5[a]	42.3[a]	14.8–94.4[a]
	250.5[b]	103.8–476.8[b]	62.0[b]	25.7–118.0[b]
Average across models	199.6	88.7–339.8	49.4	22.0–84.1

[a] Estimate based only on mortality data from studies with year-round sampling coverage.
[b] Estimate based on data from all studies meeting inclusion criteria.

The model using only year-round mortality rates from the United States produced the lowest annual estimate (median =145.7 million; 95% CI =61.9–274.6 million), and the model including both year-round and partial-year mortality rates, and rates from both the United States and Europe produced the highest estimate, and the estimate with the greatest range of uncertainty (median =250.5 million; 95% CI =103.8–476.8 million).

[64] Jacobson, S.L., (2005), Mitigation measures for highway-caused impacts to birds. In: Ralph, C. John; Rich, Terrell D., editors 2005. Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference. 2002 March 20-24; Asilomar, California, Volume 2 Gen. Tech. Rep. PSW-GTR-191. Albany, CA: U.S. Dept. of Agriculture, Forest Service, Pacific Southwest Research Station: p. 1043-1050. Retrieved from: https://www.srs.fs.usda.gov/pubs/32104
[65] Loss S.R., T. Will, and P.P. Marra, (2014), Estimation of Bird-Vehicle Collision Mortality on U.S. Roads, The Journal of Wildlife Management 78(5):763–771; DOI: 10.1002/jwmg.721. Retrieved from: https://www.fws.gov/migratorybirds/pdf/management/lossetal2014birdvehiclecollisions.pdf

Closer to home, Volk, et. al. (2020) indicate that the Suncoast Connector study area and the existing U.S. 19/U.S. 27/U.S. 98 corridor are not only currently at risk from flooding and coastal storms, but that sea level rise and climate change will significantly exacerbate these risks in the future. Their findings include that at least 30 percent of the study area is already at risk from a Category 5 storm surge, with sea level rise projected to increase that risk even further. They point to the fact that the specific region provides one of the best opportunities for coastal biodiversity to functionally respond to increasing sea level rise. A new major highway corridor along with the additional development will complicate biodiversity conservation and resiliency efforts. They recognize that a certain degree of investment is necessary to maintain both a vibrant economy, expansion of infrastructure within the Suncoast Connector study area as proposed in SB 7068 will only increase the amount and cost of development and assets at risk from existing and expanding coastal hazards. This will result in higher costs for mitigation and recovery from storm events, as well as increased costs for future adaptation to long term hazards such as sea level rise. [66]

[66] Volk, Nettles, and Hoctor (2020).

4. Economic Demographics

Table 3 provides an economic sketch on the Suncoast Connector region, relative to Florida, with breakouts to pertinent counties. Not regarding the vintage of data available, the Suncoast Connector region comprises approximately 0.8 percent of Florida's Total Output (Sales/Revenues) for 2019. The Table is setup to provide one of the signatures of the region, namely the natural resources-based industries, where natural resources is defined as agricultural, forestry, fishing, and hunting, with wood, pulp, and paper industries. The highlighting in the fourth row ranges from blue at a low relative share, to red with a high relative share. Both the Suncoast region as a whole, as well as the specific counties in particular, except for Citrus, show higher shares of natural resources industries than the Florida economy at large. The two largest sectors in Florida are Services, and Trade and Transportation. Only Citrus and Levy and, to a certain degree, Jefferson counties have a similar presence in Services only. Taylor County is the only county to have some level of manufacturing activity. In addition to Services, other counties follow next with Government. In short, the Natural Resource economies are rather important for the region.

Table 3. Economic Profile, Suncoast Connector Region and Florida State, Dollar Value of Output (Sales/Revenues) in the Natural Resource-Based Industries, and Other Industries (2020$)

Industry	Florida	Suncoast Region	Dixie County	Jefferson County	Levy County
All Industries	$1,934,806,340,921	$14,813,349,860	$551,665,518	$702,123,435	$1,862,529,776
All Industries (in $ Mil)	**$1,934,806**	**$14,813**	**$552**	**$702**	**$1,863**
Natural resource-based industries	**$16,099,958,384**	**$1,264,711,787**	**$142,640,629**	**$46,171,268**	**$162,758,067**
Natural resources industries %	**0.83%**	**8.54%**	**25.86%**	**6.58%**	**8.74%**
Farming	**$7,634,286,131**	**$483,013,648**	**$14,027,903**	**$23,445,927**	**$123,580,231**
Crops	$5,941,328,138	$214,524,182	$8,247,298	$10,857,232	$68,549,094
Livestock (Beef Cattle Ranching, Feed Lots)	$533,914,507	$58,312,877	$1,297,598	$8,345,532	$18,049,100
Dairy Cattle, Milk Prod., Poultry & Egg	$908,036,116	$173,336,106	$4,089,187	$3,387,543	$5,137,011
All Other Animal Prod. (incl. Aqua.)	$251,007,370	$36,840,484	$393,819	$855,620	$31,845,026
Forestry	**$481,445,178**	**$72,128,785**	**$9,299,941**	**$3,146,750**	**$11,145,787**
Support for farming and forestry	**$2,071,340,652**	**$41,658,875**	**$948,408**	**$5,051,805**	**$20,438,553**
Commercial fishing and hunting	**$430,783,885**	**$25,277,795**	**$2,469,783**	**$14,039,367**	**$836,427**
Natural resource-based mfg.	**$5,482,102,537**	**$642,632,684**	**$115,894,595**	**$487,419**	**$6,757,069**
Wood products	$3,912,576,765	$207,567,178	$115,894,595	$487,419	$6,757,069
Pulp and paper	$1,569,525,772	$435,065,506	$0	$0	$0
All Other Manufacturing Net	$168,018,574,912	$1,170,217,594	$22,021,604	$26,921,722	$254,751,377
All other manufacturing	$173,500,677,448	$1,812,850,278	$137,916,198	$27,409,141	$261,508,446
Utilities, construction, and mining	$162,090,866,860	$3,710,973,902	$42,171,971	$175,124,426	$305,022,693
Trade and transportation	$184,288,072,421	$1,154,646,361	$44,839,641	$83,482,869	$198,128,530
Services	$881,096,777,819	$5,166,581,025	$165,383,908	$250,317,275	$577,968,748
Government	$25,441,104,074	$67,327,889	$4,102,936	$2,205,486	$12,874,483

Industry	Taylor County	Citrus County	Gilchrist County	Lafayette County	Madison County
All Industries	$1,524,931,766	$8,164,558,928	$702,498,946	$333,423,830	$971,617,734
All Industries (in $ Mil)	**$1,525**	**$8,165**	**$702**	**$333**	**$972**
Natural resource-based industries	**$533,966,348**	**$31,331,395**	**$117,606,862**	**$100,480,993**	**$129,756,220**
Natural resources industries %	**35.02%**	**0.38%**	**16.74%**	**30.14%**	**13.35%**
Farming	**$8,832,545**	**$12,486,745**	**$100,483,839**	**$98,130,095**	**$102,026,360**
Crops	$5,969,195	$8,446,210	$38,087,908	$30,498,649	$43,868,593
Livestock (Beef Cattle Ranching, Feed Lots)	$2,171,158	$2,709,537	$9,145,260	$6,866,295	$9,728,395
Dairy Cattle, Milk Prod., Poultry & Egg	$255,306	$96,788	$52,467,951	$60,608,886	$47,293,435
All Other Animal Prod. (incl. Aqua.)	$436,885	$1,234,209	$782,720	$156,265	$1,135,936
Forestry	**$33,201,469**	**$762,786**	**$3,289,733**	**$899,252**	**$10,383,066**
Support for farming and forestry	**$3,059,285**	**$4,253,420**	**$6,166,509**	**$417,713**	**$1,323,178**
Commercial fishing and hunting	**$1,618,821**	**$5,739,997**	**$61,991**	**$10,070**	**$501,339**
Natural resource-based mfg.	**$487,254,227**	**$8,088,447**	**$7,604,791**	**$1,023,862**	**$15,522,276**
Wood products	$52,188,722	$8,088,447	$7,604,791	$1,023,862	$15,522,276
Pulp and paper	$435,065,506	$0	$0	$0	$0
All Other Manufacturing Net	$291,479,002	$264,594,993	$97,894,174	$26,108,820	$186,445,924
All other manufacturing	$778,733,229	$272,683,440	$105,498,964	$27,132,682	$201,968,200
Utilities, construction, and mining	$108,329,131	$2,851,582,948	$99,904,614	$16,111,888	$112,726,253
Trade and transportation	$90,580,477	$579,176,044	$45,120,918	$39,237,540	$74,080,343
Government	$7,125,603	$34,973,681	$2,354,762	$1,006,255	$2,684,682

Source: Bureau of Economic Analyses, in conjunction with Bureau of Labor Statistics, and CEFA estimates. Values may not add due to non-disclosure, with not enough data for cross estimations.

Drilling down to local levels, Figures 4, 5, 6, and 7 depict relative employment in the Cities of Perry, Monticello, Cross City, and Chiefland, all in terms of percentages of Taylor, Jefferson, Dixie, and County employment, respectively.[67]

As per the US Census, the City of Perry had a population of 7,017 in 2010 (U.S. Census), 2,661 households, and 1,828 families. Its population estimate for 2018 was 5,928 (U.S. Census, Population and Housing Units Estimates). It is the county seat of Taylor county. Perry is recognized as the Tree Capital of the South nestled along Florida's Nature Coast. The City of Perry is the only incorporated city in Taylor County, Florida. It was incorporated in 1903 and adopted its City Charter on May 12, 1981. Its economy is diverse, with fresh and saltwater fishing (including scalloping), hunting, agriculture and manufacturing, and a medical arts facility. Monticello counts 2,425 people (2018 estimate, relative to 2,506 in Census 2010), 973 households, and 664 families. It is the county seat of Jefferson County. The most common industries in Monticello, FL (%) are: Public administration (18.4%), Health care (10.6%), Educational services (6.8%), Accommodation & food services (6.1%), Construction (5.8%), Agriculture, forestry, fishing & hunting (5.5%), and Food & beverage stores (4.7%).[68] Likewise, Cross City had a population of 1,712 (2018 estimate, relative to 1,728 in Census 2010, and 1,775 people, 686 households, and 478 families as per Census 2000). Cross City is the county seat of Dixie County. The most common industries in Cross City , FL (%) are: Manufacturing (20.7%), Accommodation & food services (15.5%), Retail trade (13.1%), Health care and social assistance (12.6%), Educational services (7.2%), Agriculture, forestry, fishing, hunting (5.0%).[69] The population of Chiefland was estimated at 2,169 (2,245 at the 2010 Census, and 1,993 people, 796 households, and 511 families residing in the city as per Census 2000). Chiefland calls itself the "Gem of the Suwannee Valley" and was incorporated in 1929. Chiefland is in the northwest corner of the county, where Levy, Dixie and Gilchrist counties adjoin (known as the "Tri-County area"). The area's economy is traditionally based on agriculture, primarily farming (peanuts, watermelons, hay); ranching (cattle, hogs); dairy (milk); timber (pulpwood, lumber, turpentine) and aquaculture (fishing, oystering, crabbing).[70]

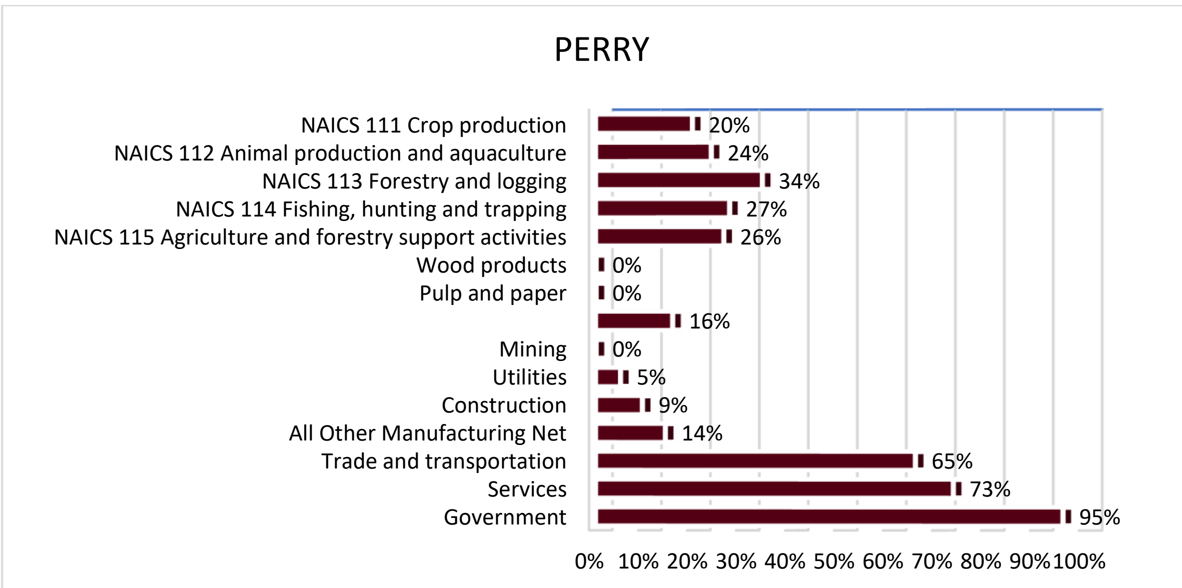
All four cities are to be labeled Urban, given their population densities and the definition by the US Census (see Table 18 in the Appendix). Despite the larger size of the City of Perry, its' local impact is less dominant than that of Monticello or Cross City, relative to its locale. In comparing the figures, it may be discerned that Perry is more of a regional "capital" city, with a more diverse economic profile, and with ample rural activities. Monticello and Cross City

[67] Employment data used for the cities of Perry and Chiefland are retrieved from Chmura, using QCEW. Data retrieved from http://www.chmuraecon.com/jobseq/. Employment data for the Cross City and Monticello is derived from the National Establishment Times-Series (NETS) database, Walls & Associates, release 2015. County data is also retrieved from Chmura.
[68] Data retrieved from: http://www.city-data.com/city/Monticello-Florida.html
[69] Data retrieved from: https://www.bestplaces.net/economy/city/florida/cross_city
[70] Info retrieved from: https://en.wikipedia.org/wiki/Chiefland,_Florida
See also: https://www.towncharts.com/Florida/Economy/Chiefland-city-FL-Economy-data.html

on the other hand have a more 'insular' signature, with a far less diverse economy i.e. with a significant dependence on natural resource-based economics, and with scant surrounding activities. The Chiefland economy exerts a minor impact relative to Levy county.

Given that neither city, nor their respective counties, are interstate in terms of proximity to large cities or having greater than 25,000 residents, potential benefits will dwindle fast.[71] Put differently, all cities are to be considered vulnerable to economic impacts and/or structural economic changes.

Figure 4. Employment City of Perry as a Percentage of Total Employment Taylor County (2019)



[71] See p.1, Rephann, and Isserman (1994).

Figure 5. Estimated Employment City of Monticello as a Percentage of Total Employment Jefferson County (2015)

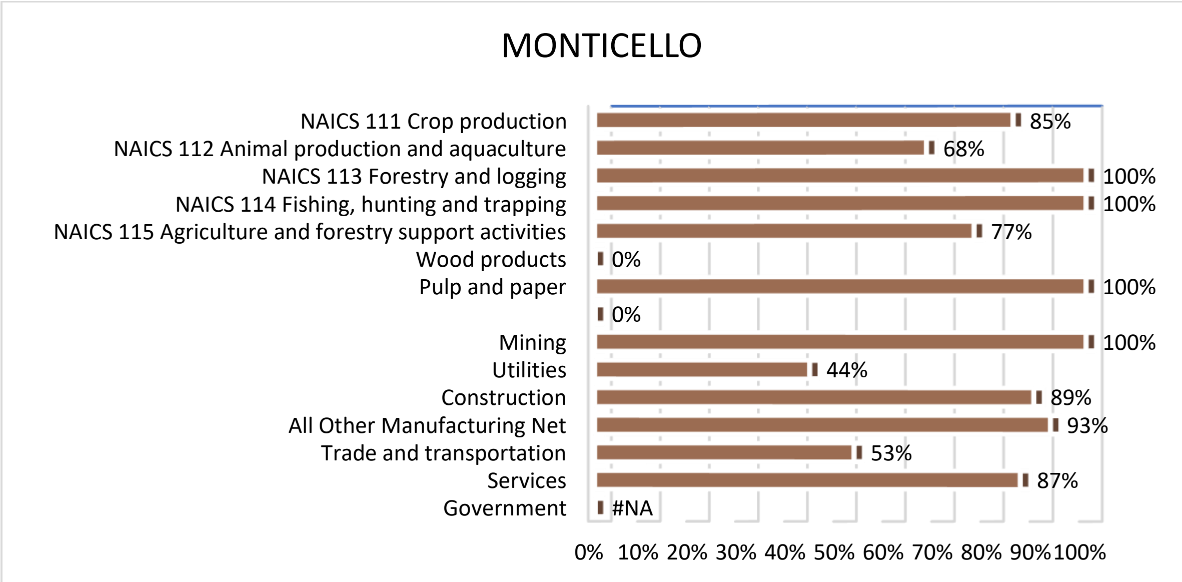


Figure 6. Estimated Employment Cross City as a Percentage of Total Employment Dixie County (2015)

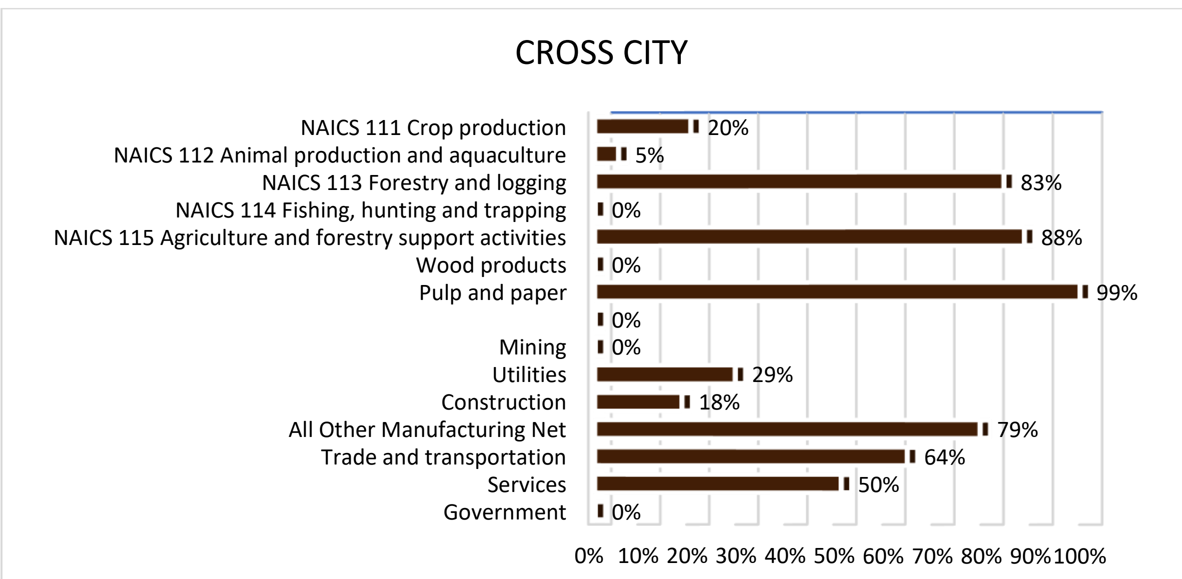
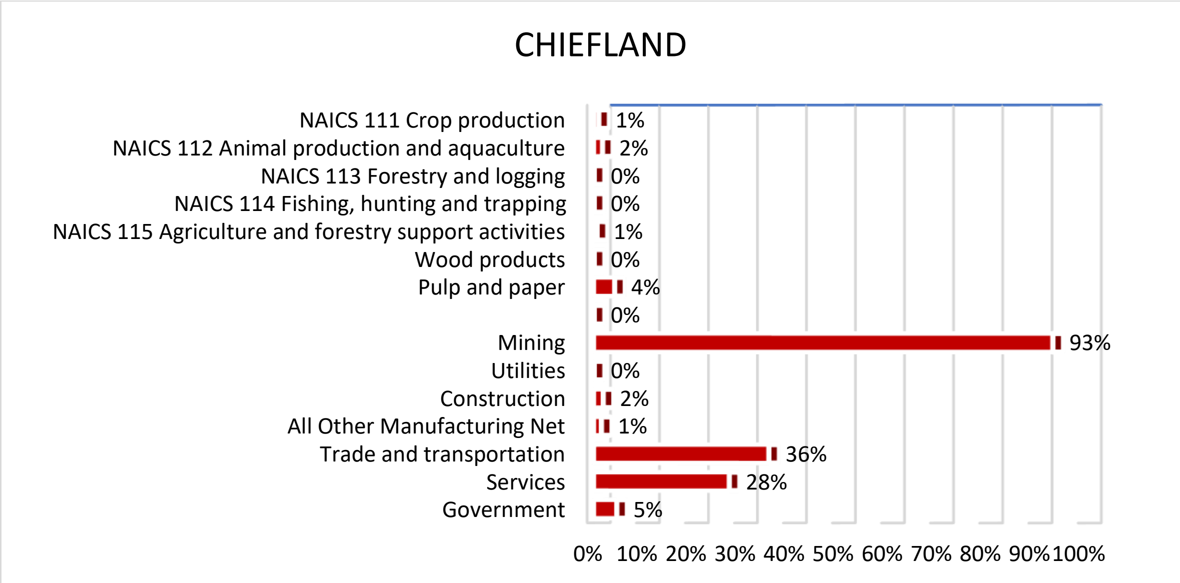


Figure 7. Estimated Employment Chiefland as a Percentage of Total Employment Levy County (2019)



A standard starting point to quantify costs and benefits is using a travel demand model measuring mobility. In this case, however, the application is a bit different, given that the Suncoast Connector would only provide an added choice for connectivity options North-South, with the alternatives being the US19, as well as the US75, and to some extent US95. Although a choice relating to road construction comes with indivisibilities, the rationale for construction is that it needs to be supported by costs due to re-routing (distance) and/or congestion, not new construction pe se. Admittedly, cost associated with inadequate road infrastructure can amount to billions of dollars. For example, it has been estimated that congestion costs the U.S. 3.7 billion hours of delay and 2.3 billion gallons of wasted fuel per year (2003 data), considering unreliability, inventory, and environmental impacts (Shrank, 2005).[72] The question is, would congestion on the existing roads warrant the construction expenses for a new road over a stretch of 150-plus miles? Even if this were the case, i.e. the costs leveraged with the potential benefit of increased traffic flow, the price of a toll levied will set the benefit back. The Suncoast Connector does not create or unlock a new connection or opportunity, as there are currently direct alternatives or adequate substitutes in place with opportunities to meet and alleviate local issues.

[72] Schrank, D., T. Lomax, (2005), Texas Transportation Institutes, The 2005 Urban Mobility Report, Texas A&M University. Retrieved from: https://static.tti.tamu.edu/tti.tamu.edu/documents/umr/archive/mobility-report-2005.pdf

Next on an approach may be the benefits of construction. There will be direct economic construction activities that will generate indirect and induced rounds of activity. However, these will be transient. Once construction is done, the activities including their spin-off are lost. This begs the overall question, of what will remain tied to the local economy once construction is completed. Most construction spending will be in materials, and use of equipment, neither local by any stretch. Labor will come with the contractor, moving along with the construction trajectory (i.e. perhaps there will be scant local hire). Admittedly, some earnings will be spent locally, but the bulk of payment will go from State budget or accounting officer to contractor account(s), likely not local.

Lastly, from the local perspective, there will be land sold, and lost from the local economy in perpetuity. Considering road width, and the trajectory alone, i.e. excluding ramps, intersections, etc.., ground lost may be estimated at 1,600 acres at the bare minimum.[73] Land presently used for natural resource economics, as described, will be a major part of the grounds lost. In addition, adjacent lands to the Suncoast Connector trajectory will become unfit for agriculture and livestock, and water streams polluted (not only locally, but downstream as well). Local economies will have to adapt and adjust to changing local economic structures, with less natural based activities, in exchange for activities related to bypass travelers. The proverbial u-shaped adjustment, as mentioned in the literature review, will take its time. From the local perspective, there is little benefit or need/use for a road in the backyard if you already have one in the front yard.

As indicated above in the economic literature review, few studies besides Aschauer (1990) estimate elasticity parameters, which can inform policy debates about the returns to infrastructure investment. Table 4 provides rough estimates by the research team of the marginal rate of return, implied by the mean output elasticities reported in Table 1.

[73] It should be noted that it is unknown at the time of this report how much additional Right of Way (ROW) will be needed.

Table 4. Estimated Marginal Returns to Different Types of Public Capital

Marginal Returns to:		Florida FSU (CEFA est.)	Ann. Avg. Depr. Rate & Ec. Lifespan		Time delay days (~yrs.)	
NAICS	Total Public Capital	0.067	2.87	34.9 yrs	1,014	(2 7/9)
237110	Water and Sewer Line and Related Structures Construction	0.033	1.87	53.5 yrs	150	(2/5)
237120	Oil and Gas Pipeline and Related Structures Construction	#N/A	#N/A	#N/A	365	(1)
237130	Power and Communication Line and Related Structures Construction	0.176	5.12	19.5 yrs	750	(2)
237210	Land Subdivision	#N/A	#N/A	#N/A	913	(2½)
237310	Highway, Street, and Bridge Construction	0.058	2.85	35.1 yrs	131	(1/3)
237990	Other Heavy and Civil Engineering Construction	#N/A	#N/A	#N/A	931	(2 5/9)
238910	Site Preparation Contractors	0.130	3.39	29.5 yrs	41	(1/9)
238990	All Other Specialty Trade Contractors	0.097	3.44	29.4 yrs	43	(1/8)
562910	Remediation Services	#N/A	7.61	13.2 yrs	365	(1)
562920	Materials Recovery Facilities	#N/A	#N/A	#N/A	541	(1½)
562991	Septic Tank and Related Services	0.107	4.11	24.3 yrs	64	(1/6)
562998	All Other Miscellaneous Waste Management Services	0.464	5.37	18.6 yrs	154	(3/7)

Notes: QCEW and NETS data for Years 1990-2015[74]
NAICS code selection as per CEA.[75]
K for each specific industry is estimated by $K_{t-1} + O_t - D_{t-1} = K_t$ in which K is capital stock (no breakout of public private is possible based on the NAICS),
O = Output
D = depreciation, and t is a time indicator.
Next, it is assumed that depreciation is a constant percentage over the year's capital stock is used for the period 1990-2015.
t includes time delay specific to each code based on maximization of R^2.
Indexed at 2015$, and #N/A does not resolve for the two conditions or equations due to continuous diminishing capital returns.

The highlights are provided as "closest" corresponding rows "in name" or category with respect to Table 1. Obviously, the "Highway, Street, and Bridge Construction" (NAICS 237310) is the most pertinent to the Suncoast Connector project. From the estimates it may be taken that the marginal returns on the road construction sector is next to the last, or next to lowest, in rank. Likewise, is the sectors' rate of depreciation, and conversely, the economic lifespan. The time delay with respect to optimizing the investment to capital is lower than expected, indicating a skew towards rather smaller infrastructure projects. It is also noted that the aforementioned "Highway, Street, and Bridge Construction" industry (NAICS 237310) does not differentiate in projects to type, size, new or upgrading, public or private, location (but for Florida), etc.

[74] Based on QCEW data and NETS (from 1990 to 2015).
[75] p.24, CEA (2018).

Tables 5 and 6 provide ranking on IMPLAN multiplier factors for spending on public capital projects (sectors as defined by the CEA[76]).[77] NAICS sectors “Water and Sewer Line and Related Structures Construction” (NAICS 237110) and “Highway, Street, and Bridge Construction” (NAICS 237310) are highlighted in the same colors as above (in Tables 1 and 4). Red-blue shading is provided to indicate high to low ranking(s) on the multipliers. Averages in the last column are un-weighted averages.

Table 5. IMPLAN Total Output Multipliers Ranked for Selective Public Capital Activities

NAICS		Citrus	Dixie	Gilchrist	Jefferson	Lafayette	Levy	Madison	Taylor	Average
237110	Water and Sewer Line and Related Structures Construction	5	n/a	2	2	n/a	2	2	n/a	2
237120	Oil and Gas Pipeline and Related Structures Construction	11	2	12	12	n/a	8	n/a	2	10
237130	Power and Communication Line and Related Structures Construction	5	n/a	2	2	n/a	2	2	n/a	2
237210	Land Subdivision	1	1	1	1	5	1	1	1	1
237310	Highway, Street, and Bridge Construction	12	9	11	11	3	12	11	9	12
237990	Other Heavy and Civil Engineering Construction	10	8	10	7	4	11	10	8	11
238910	Site Preparation Contractors	8	6	8	5	1	9	8	3	8
238990	All Other Specialty Trade Contractors	8	6	8	5	1	9	8	3	8
562910	Remediation Services	2	3	2	8	6	5	5	5	5
562920	Materials Recovery Facilities	2	3	2	8	6	5	5	5	5
562991	Septic Tank and Related Services	5	n/a	2	2	n/a	2	2	n/a	2
562998	All Other Miscellaneous Waste Management Services	2	3	2	8	6	5	5	5	5

Sources: IMPLAN

[76] p.24, CEA (2018).
[77] Ranking is used since IMPLAN contractually prohibits users from publishing industry multipliers.

Table 6. IMPLAN Total Employment Multipliers Ranked for Selective Public Capital Activities

NAICS		Citrus	Dixie	Gilchrist	Jefferson	Lafayette	Levy	Madison	Taylor	Average
237110	Water and Sewer Line and Related Structures Construction	9	n/a	8	9	n/a	2	6	n/a	8
237120	Oil and Gas Pipeline and Related Structures Construction	12	9	12	12	n/a	12	n/a	8	12
237130	Power and Communication Line and Related Structures Construction	9	n/a	8	9	n/a	2	6	n/a	8
237210	Land Subdivision	1	1	1	4	7	1	1	1	1
237310	Highway, Street, and Bridge Construction	8	8	11	8	8	11	11	9	11
237990	Other Heavy and Civil Engineering Construction	2	2	2	5	4	8	2	5	5
238910	Site Preparation Contractors	6	3	6	6	5	9	9	6	6
238990	All Other Specialty Trade Contractors	6	3	6	6	5	9	9	6	6
562910	Remediation Services	3	5	3	1	1	5	3	2	2
562920	Materials Recovery Facilities	3	5	3	1	1	5	3	2	2
562991	Septic Tank and Related Services	9	n/a	8	9	n/a	2	6	n/a	8
562998	All Other Miscellaneous Waste Management Services	3	5	3	1	1	5	3	2	2

Sources: IMPLAN

From the tables it may be evident that "Highway, Street, and Bridge Construction" ranks twelfth of the twelve public infrastructure investments sectors. Labor on the same industry ranks eleventh out of twelve. In addition, it is observed by the research team that even the high-ranking sector "Land Subdivision" (NAICS 237210), in this small subset of infrastructure sectors isn't a particular high "rider" in economic impact.

5. Economic Methodology Associated with the Long-Term Impacts of Bypassing Perry, Monticello, Chiefland, & Cross City

Earlier in the narrative there are demographic data provided relating to the towns of Perry, Monticello, Chiefland and Cross City. If the Suncoast Connector were to bypass these towns there would be some expected revenue (and job) losses to these towns. The research team generated a list of total jobs based on Chmura data[78] for the towns of Perry and Chiefland and identified those industries that would be most likely to be most impacted by the Suncoast Connector bypassing their communities. While not all employees of those industries would be impacted by the bypass, the research team assumed a sample (or 87 and 93 direct jobs for Perry and Chiefland, respectively) would be representative of those employees impacted by the bypass. Unfortunately, the data was unavailable in Chmura for Monticello and Cross City, but the research team used data from another source.[79] Using a similar methodology, Monticello's expected job losses due to the bypass would be 18 and 16 direct jobs for Monticello and Cross City, respectively.

The research team used a well-established analytical tool known as the Impact Analysis for Planning, or IMPLAN® model[80]. IMPLAN is a widely accepted integrated input-output model that is used extensively by state and local government agencies to measure proposed legislative and other program and policy economic impacts across the private and public sectors. There are several advantages to using IMPLAN:

- It is calibrated to local conditions using a relatively large amount of local county level and state of Florida specific data;
- It is based on a strong theoretical foundation, and;
- It uses a well-researched and accepted applied economics impact assessment methodology supported by many years of use across all regions of the U.S.

The economic impact model used for this analysis was specifically developed for the counties of Florida, and includes 534 sectors, 25 institutional sectors, and latest dataset – year 2018 data. IMPLAN's principal advantage is that it may be used to estimate direct, indirect and induced economic impacts for any static (point-in-time) economic stimulus. Consistent with standard practice, the direct impacts associated with the proposed project, as well as the indirect and induced impacts are calculated for the relevant Suncoast Connector counties. The results pertain to the proposed Suncoast Connecter's construction activities' broader economic benefits, measured in terms of economic output (the value of industry production), local employment or jobs, and income or wages.

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[78] See: http://www.chmuraecon.com/jobseq/

[79] See: https://datausa.io/profile/geo/monticello-fl Data based on U.S. Census Bureau ACS PUMS 5-Year Estimate

[80] For more information on IMPLAN, see: www.implanpro.com

The project will generate the following types of long-term economic benefits and costs in the Suncoast Connector-related economy:

- Direct Benefits and Costs. Direct benefits and costs relating to the long- term ongoing business activity associated with the businesses that are located within the developed project.
- Indirect Benefits and Costs. Indirect benefits and costs will result when local firms directly impacted by the project in turn purchase materials, supplies or services from other firms.
- Induced Benefits and Costs. Induced benefits relate to the consumption and spending of employees of firms that are directly or indirectly affected by the project. These would include all of the goods and services normally associated with household consumption (i.e., housing, retail purchases, local services, etc.).

6. Economic Impact Results of Bypass of Perry, Monticello, Chiefland, & Cross City

As shown in Tables 7 through 10, the total expected economic long-term losses due to the proposed Suncoast Connector road project are estimated to be $28 million in total economic output (sales/revenues), 304 jobs, and $8.4 million in income. Both Perry and Chiefland sustain larger losses in terms of: $12 million each in output, and about $3.5 million each in income, and 124 and 134 in projected job losses, respectively.

Table 7. Total Economic Impacts Loss Based on Suncoast Connector Bypassing Perry, Monticello, Chiefland, and Cross City, Florida (2020$)

County	Output	Jobs	Income
Perry	$12,024,783	124	$3,557,043
Monticello	$2,128,231	25	$738,007
Chiefland	$12,017,524	134	$3,446,917
Cross City	$1,844,315	21	$645,487
Total	**$28,014,853**	**304**	**$8,387,454**

Table 8. Total Jobs Lost Based on Suncoast Connector Bypassing Perry, Monticello, Chiefland, and Cross City, Florida (2020$)

County	Direct	Indirect	Induced	Total
Perry	89	11	24	124
Monticello	18	3	4	25
Chiefland	93	16	25	134
Cross City	16	2	3	21
Total	**216**	**32**	**56**	**304**

Table 9. Total Output Lost Based on Suncoast Connector Bypassing Perry, Monticello, Chiefland, and Cross City, Florida (2020$)

County	Direct	Indirect	Induced	Total
Perry	$8,096,398	$1,301,652	$2,626,733	$12,024,783
Monticello	$1,419,691	$280,994	$427,546	$2,128,231
Chiefland	$7,322,905	$1,970,157	$2,724,462	$12,017,524
Cross City	$1,299,384	$220,909	$324,022	$1,844,315
Total	**$18,138,37**	**$3,773,712**	**$6,102,763**	**$28,014,853**

Table 10. Total Income Lost Based on Suncoast Connector Bypassing Perry, Monticello, Chiefland, and Cross City, Florida (2020$)

County	Direct	Indirect	Induced	Total
Perry	$2,215,453	$368,818	$972,772	$3,557,043
Monticello	$550,170	$69,095	$118,742	$738,007
Chiefland	$2,111,818	$456,304	$878,795	$3,446,917
Cross City	$494,760	$49,757	$100,970	$645,487
Total	**$5,372,201**	**$943,974**	**$2,071,279**	**$8,387,454**

7. Vulnerability Analysis (GIS Mapping)

The objective in this section in defining the vulnerable areas is to identify the areas that should be viewed with special consideration given their vulnerability assessment. The information can be useful in prioritizing the areas of highest vulnerability along the proposed Suncoast Connector roadway throughout the eight counties.

Background on Vulnerability Analysis of the Suncoast Connector Toll Road Study Area

During the time period that FSU CEFA was working on the vulnerability analysis for this project and report, another study was published and released by the University of Florida (Volk, Nettles, and Hoctor, 2020). The research study team will briefly summarize the UF findings below.

The authors found that "the Suncoast Connector study area contains significant ecological, cultural, and agricultural assets, including sensitive ecosystems and hydrologic resources, critical ecological corridors, productive silviculture operations, and a number of culturally rich small towns and communities. …The resulting converson of existing agricultural and silvicultural land uses to development will alter production within the region as well as the state and impact related benefits including water recharge, filtration, and habitat for focal species. Fragmentation of critical ecological corridors by development will significantly impact conservation planning, reduce functional connectivity and the ability for ecosystems to respond to sea level rise, and degrade or potentially eliminate habitat for some focal species. In addition, increased development within the study area will have impacts on water quality and supply, resulting in impacts to riverine and coastal ecosystems, as well as water dependent industries such as those in the Cedar Key region. This includes further reduction in freshwater flows as a result of increased demand, which will change salinity levels and further increase the impact of sea level rise by reducing the ability of coastal ecosystems to resist and adapt to change.

Based on the data, the authors found that the study area and existing road corridor are currently at risk from flooding and the risk will only continue to increase in the future. The direct risks from sea level rise and storm surge, are highest in the southern portion of the study area. Over 50% of the study area is located in the current 100-500 year floodplain, and at least 30% is vulnerable to storm surge from a Category 5 hurricane at current sea levels. To minimize future additional risk to infrastructure and communities, it will be essential to avoid actions that increase the amount of vulnerable infrastructure and development in this region. While it's recognized that a certain degree of investment is necessary to maintain both a vibrant economy…this will result in higher costs for mitigation and recovery from storm events, as well as increased costs for future adaptation to long term hazards such as sea level rise.

To minimize negative impacts within the study area, new infrastructure must be strategically located to direct growth in ways that considers both near term impacts on existing communities, agriculture, and natural resources, and reduces future vulnerability to storms and sea level rise. However, the probability of significant and irreversible change in the study area, coupled with a high degree of vulnerability to existing and future coastal hazards suggests that this region has low suitability for supporting the kind of new highway and infrastructure corridor proposed in the M-CORES project."[81]

Geographical Information Systems Mapping (GIS)

The data for this task was compiled from a multitude of sources, ranging from public agencies, universities, and other online sources. The data (presented as GIS maps) in the following sections are representative of the existing environmental vulnerability conditions in the eight counties. In this chapter, the project team includes the following maps (with the proposed Suncoast Connector assumed adjacent to US19): property valuation (by land category type, and Florida Forever lands, and vulnerability layers extracted by the Critical Lands and Waters Project (CLIP 4.0) decision support tool.

Geographical Information Systems Mapping research assistance was provided by Dr. Georgianna Strode,[82] of FREAC. Dr. Strode provided the following county-specific maps for each of the Suncoast Connector counties, at the 1:100,000 scale. Using GIS, a buffer representing the "Suncoast Connector Road" was constructed 250 feet wide east of US19. If parts of the buffer overlaid Florida Forever lands, the buffer was redirected more easterly to avoid those lands (in some cases the new buffer may cross Florida Forever land but would not be directly placed over the Florida Forever lands).

When the buffer was satisfactory, the research team intersected it with each county's property parcels acquired from the Florida Department of Revenue (FDOR). This produced a GIS layer in the shape of the buffer, but made with clipped portions of individual property parcels where the buffer overlaid. Each of the individual property pieces retains information from the parent land parcel, such as the "just value" and "land use code".[83] Additionally, each clipped portion of parcel has information on geographic area , or size, in square meters - for both the parent parcel's original size and its own trimmed up size. Therefore, it is possible

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[81] Volk, M.I., B.B. Nettles, and T.S. Hoctor. Vulnerability of the Suncoast Connector Toll Road Study Area to Future Storms and Sea Level Rise. Pp. 27-28.

[82] Florida Resources and Environmental Analysis Center (FREAC), Institute for Science and Public Affairs (ISPA), Florida State University (FSU). UCC 6140, FSU, Tallahassee, FL. 32306. www.freac.fsu.edu or usng-gis.org 850.644.5886 or 850.644.2007 gstrode@fsu.edu USNG: 16R GU 5876 7040

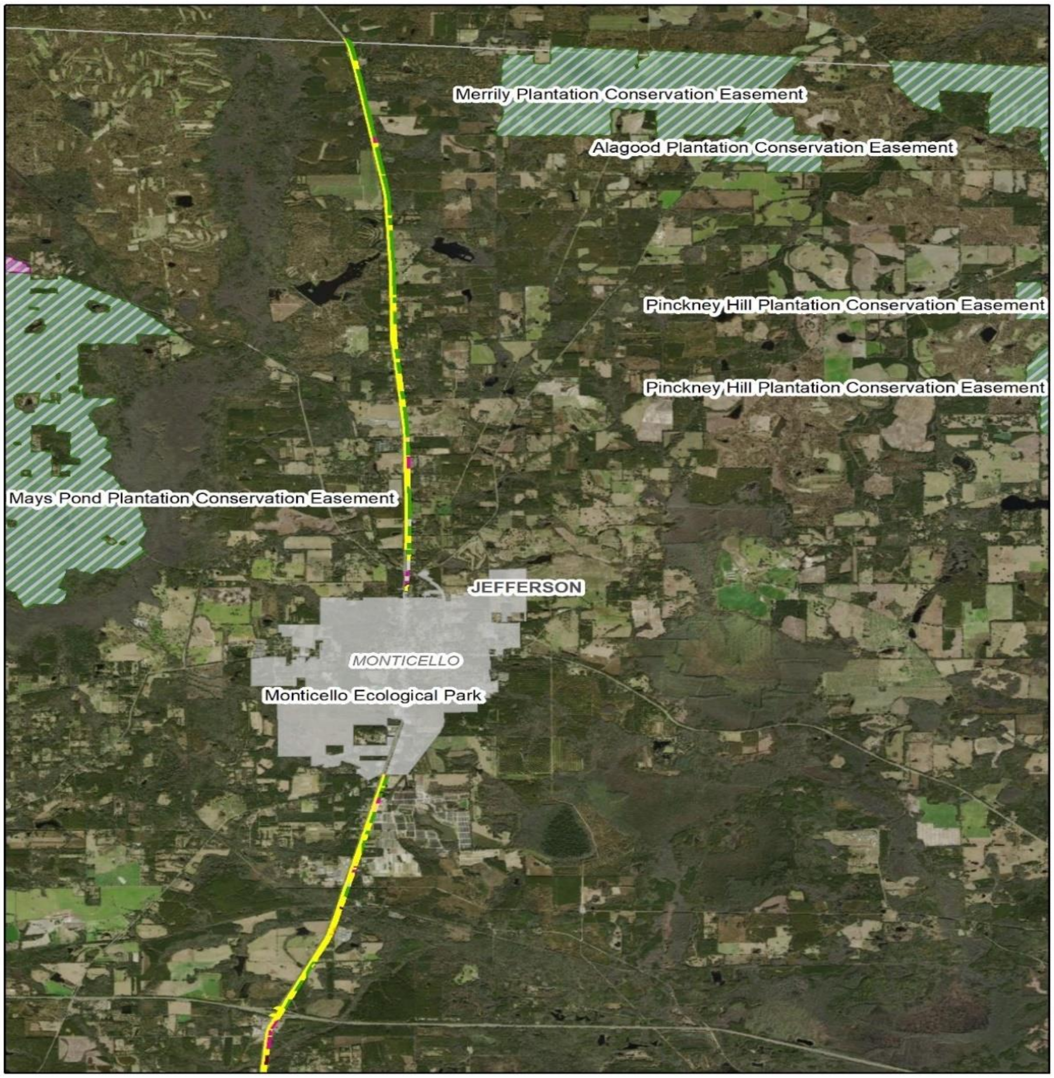
[83] As assigned by the Property Appraiser, an elected official, according to guidelines set by the Florida Department of Revenue (FDOR).

to determine what percentage of land area the clipped area is in relation to the parent area. The Just values for the clipped parcel pieces can be calculated by the following calculations: adjusted_just_value = Just_Value * (clipped area size / original parcel area size).

The following Figures 8 through 22 depict the hypothetical Suncoast Connector along a similar trajectory as US19, through primarily: Jefferson, Taylor, Dixie, Levy, Gilchrist, and Citrus counties. Each section of the Suncoast Connector is represented by land use categories (e.g., Residential, commercial, industrial, agricultural, institutional, governmental, or miscellaneous), and also includes Florida Forever and Florida Natural Areas Inventory (FNAI) Conservation Lands map layers. In addition, Figures 23 through 26 provide the outline of the Suncoast Connector overlaid the Critical Lands and Waters Identification Project (CLIP) map layers. CLIP is an organized set of natural resource data layers that are combined into five resource categories: biodiversity, landscapes, surface water, groundwater, and marine.[84] Using an aggregated CLIP model, these five natural resource data layers are further differentiated by five priority levels for natural resource conservation.

[84] See: https://www.fnai.org/pdf/CLIP_v4_user_tutorial.pdf

Figure 8. The Proposed Suncoast Connector Project through Jefferson County



Code from FDOR Parcel Land Use

- Residential
- Commercial
- Industrial
- Agricultural
- Institutional
- Government
- Miscellaneous

Conservation Lands

- Florida Forever Lands
- FNAI Conservation Lands

Figure9. The Proposed Suncoast Connector Project through Jefferson, Taylor and Madison Counties

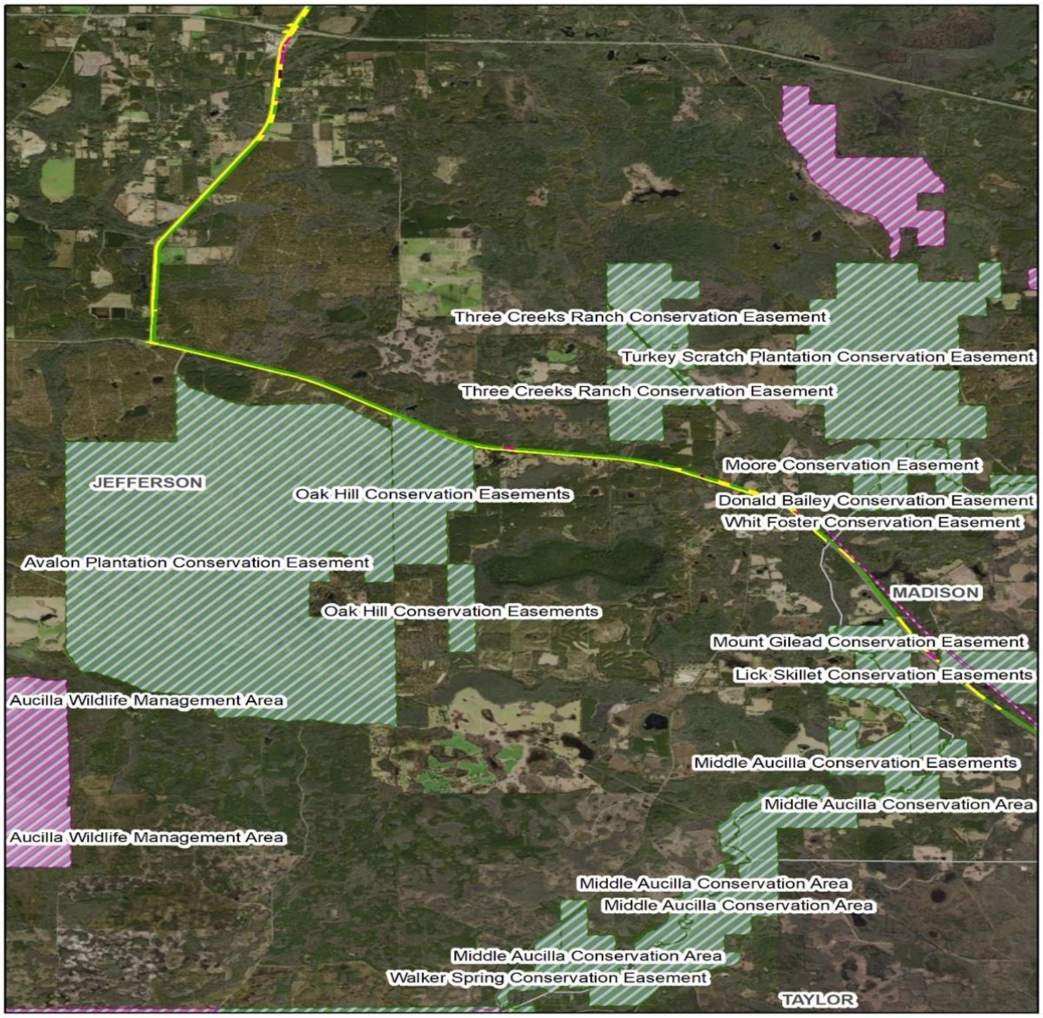
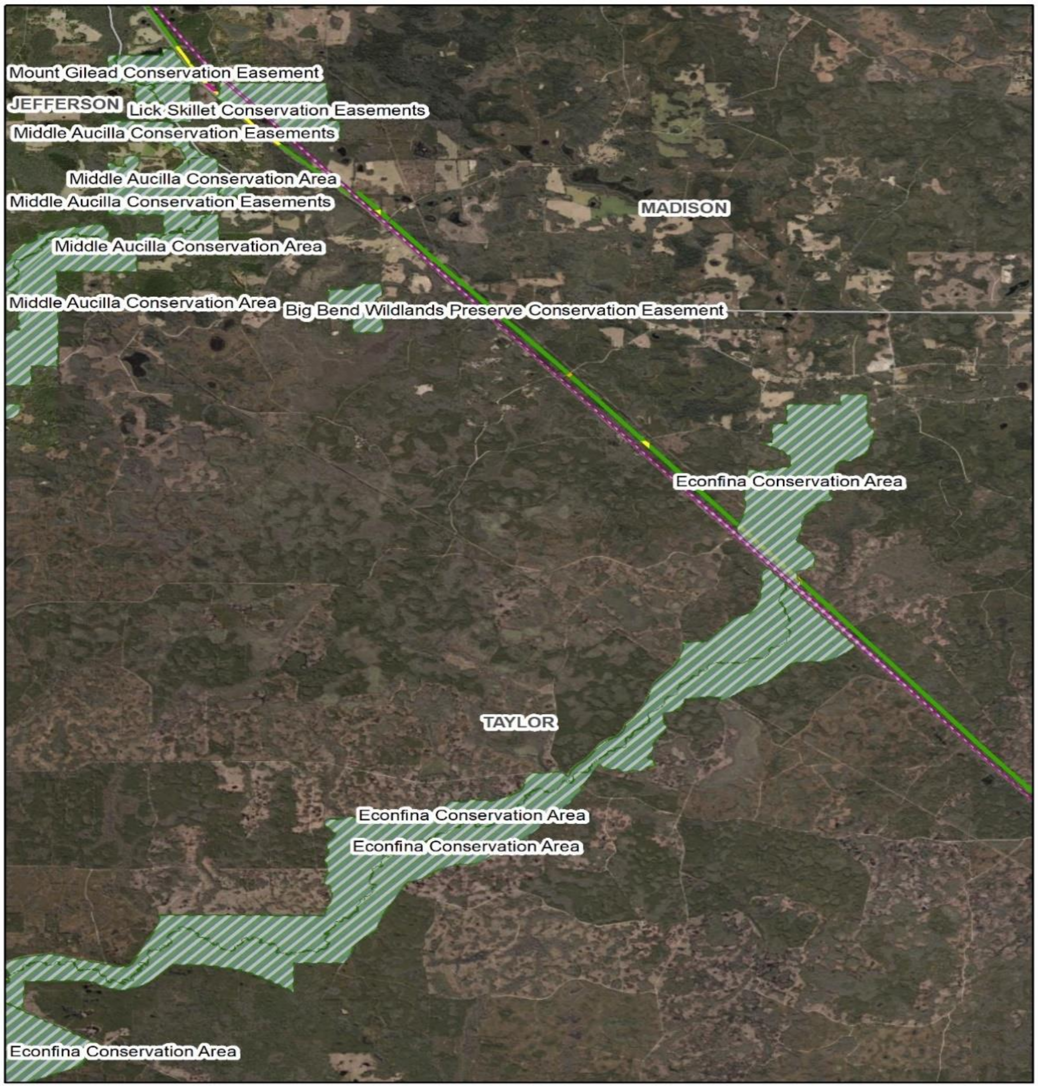


Figure 80. The Proposed Suncoast Connector Project through Taylor, Madison and Jefferson Counties



Code from FDOR Parcel Land Use

- Residential
- Commercial
- Industrial
- Agricultural
- Institutional
- Government
- Miscellaneous

Conservation Lands

- Florida Forever Lands
- FNAI Conservation Lands

Figure 91. The Proposed Suncoast Connector Project through Taylor County

Figure 102. The Proposed Suncoast Connector Project through Taylor County, Cont.

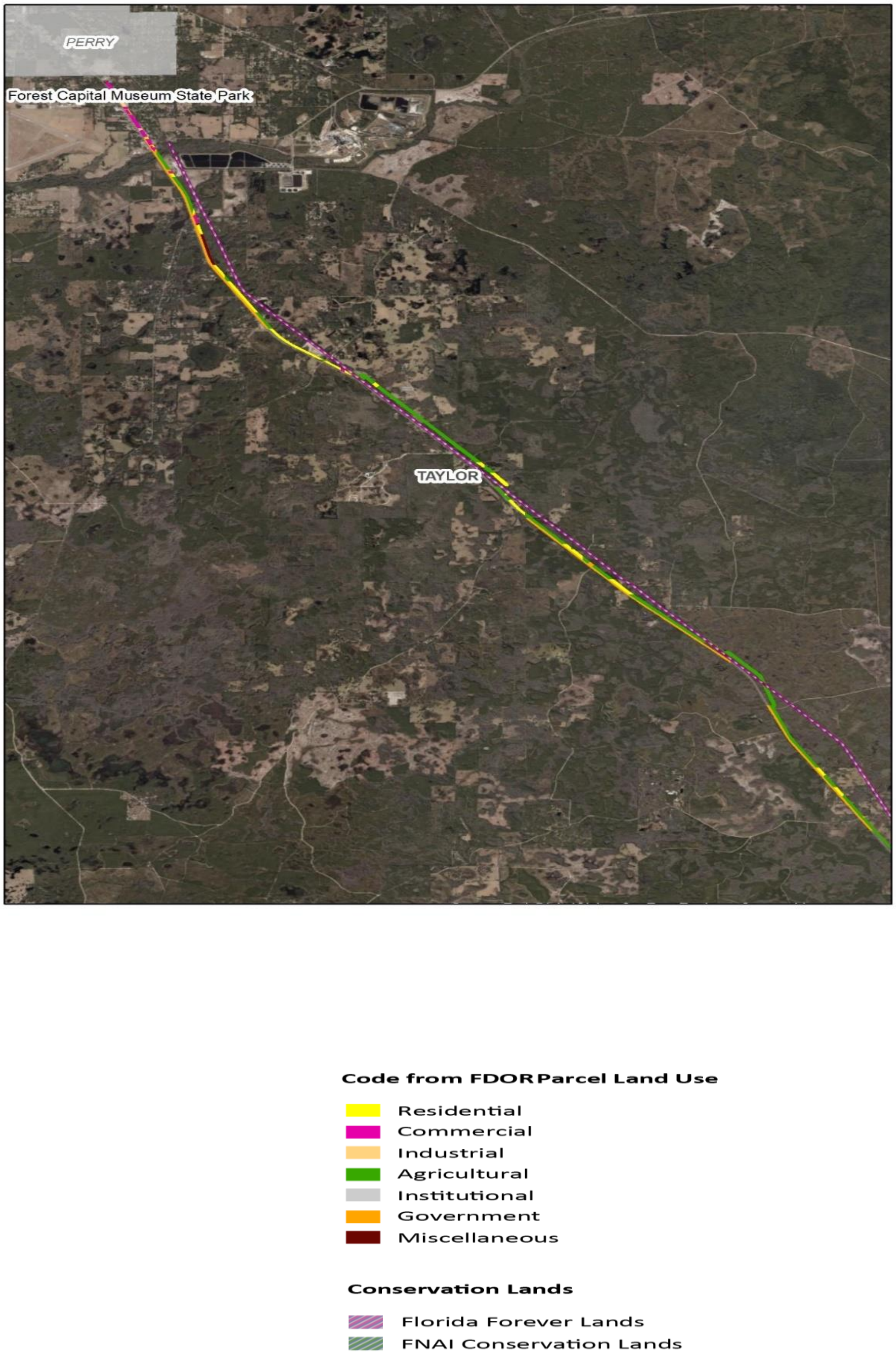


Figure 3. The Proposed Suncoast Connector Project through Lafayette, Taylor and Dixie Counties

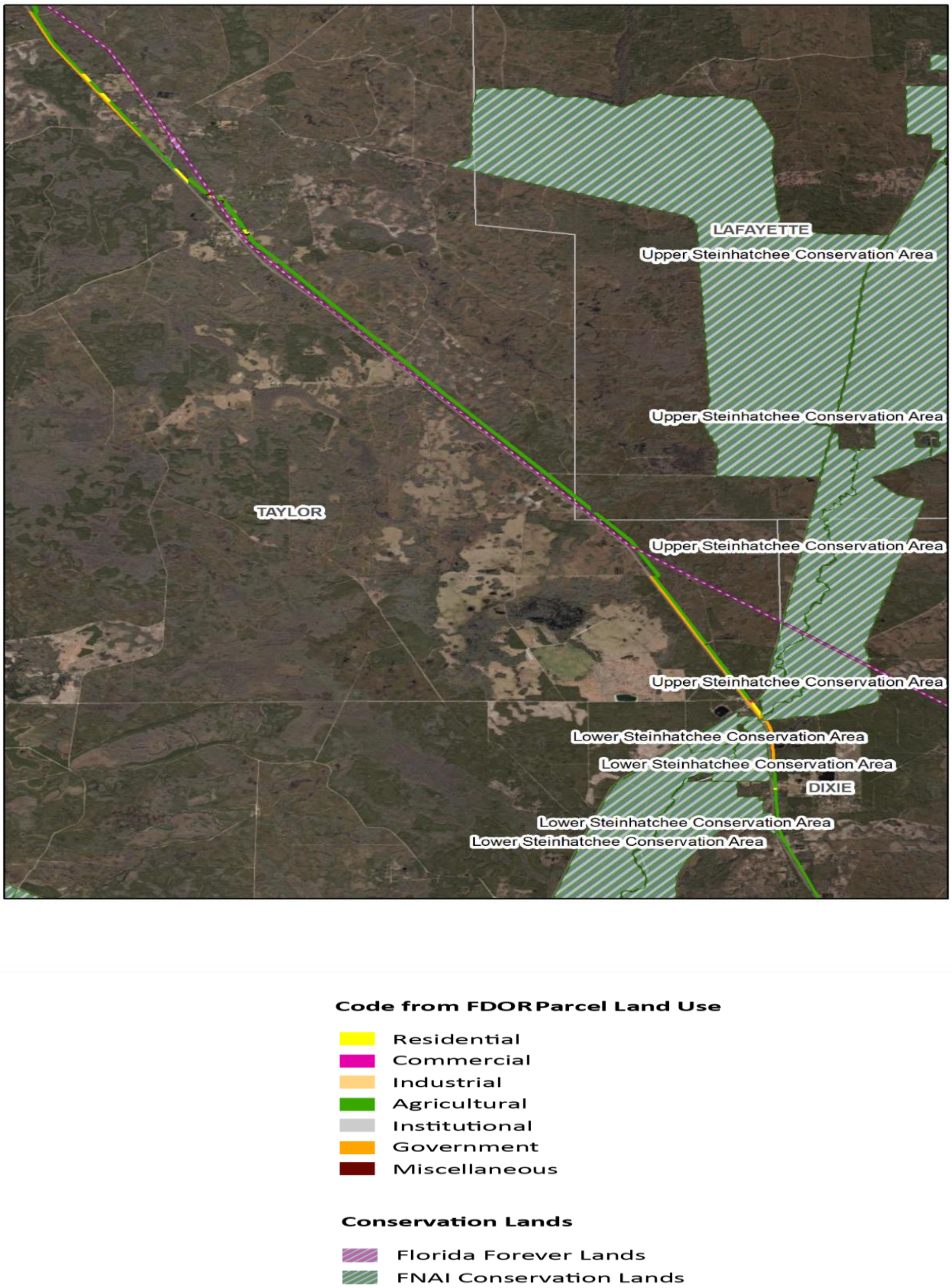
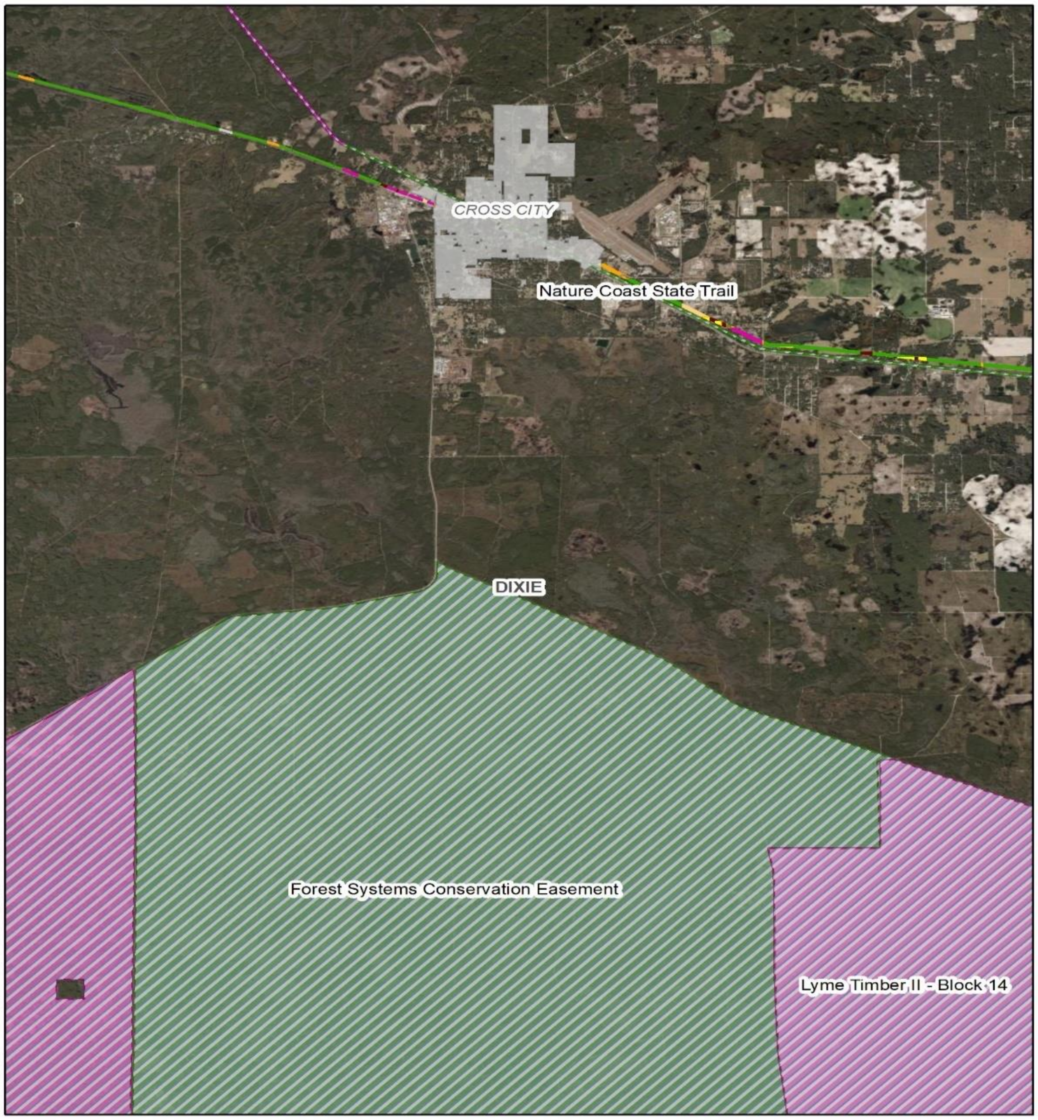


Figure 114. The Proposed Suncoast Connector Project through Dixie County

Figure 5. The Proposed Suncoast Connector Project through Dixie County, Cont.



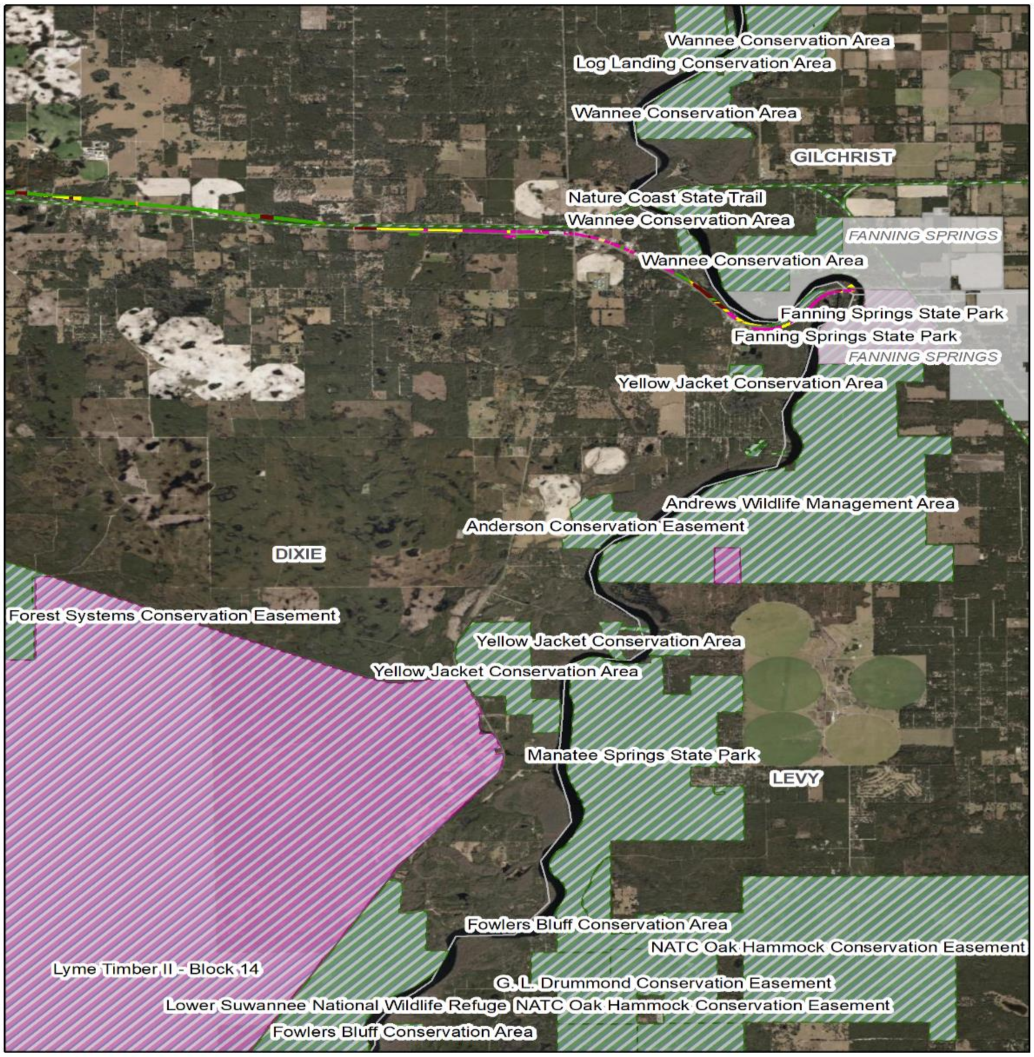
Code from FDOR Parcel Land Use

- Residential
- Commercial
- Industrial
- Agricultural
- Institutional
- Government
- Miscellaneous

Conservation Lands

- Florida Forever Lands
- FNAI Conservation Lands

Figure 126.The Proposed Suncoast Connector Project through Dixie, Levy, and Gilchrist Counties



Code from FDOR Parcel Land Use

- Residential
- Commercial
- Industrial
- Agricultural
- Institutional
- Government
- Miscellaneous

Conservation Lands

- Florida Forever Lands
- FNAI Conservation Lands

Figure 137. The Proposed Suncoast Connector Project through Levy and Gilchrist Counties

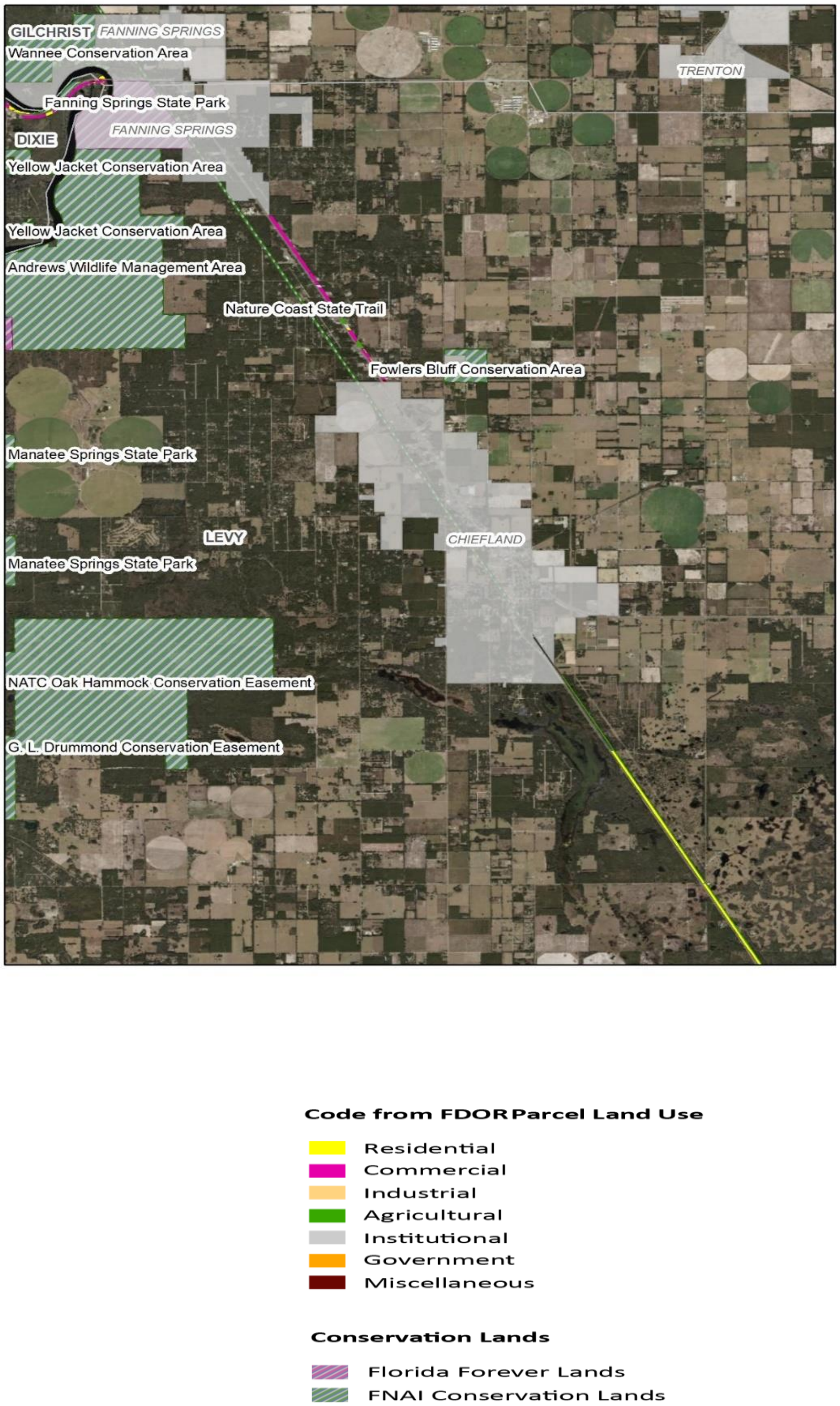
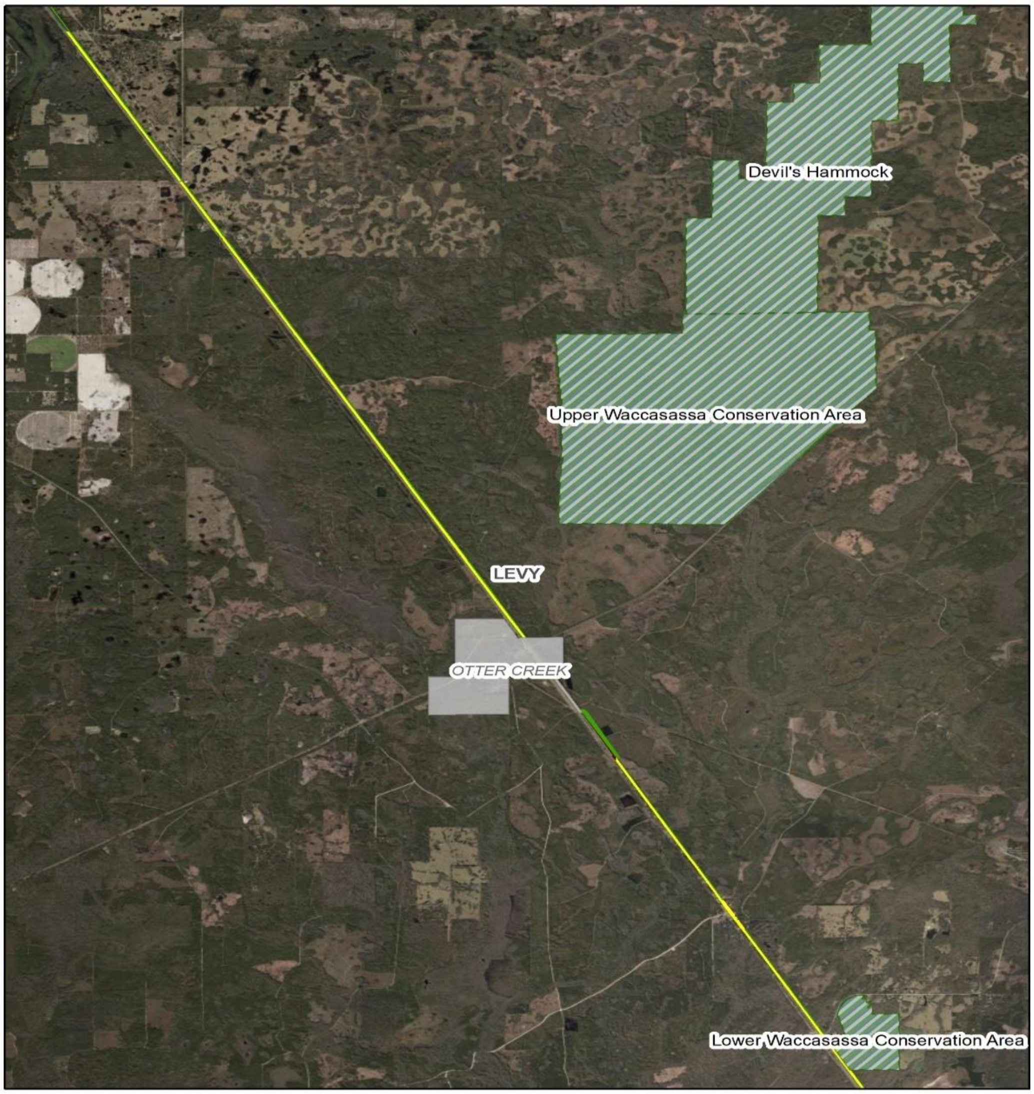


Figure 148. The Proposed Suncoast Connector Project through Levy County



Code from FDOR Parcel Land Use

- Residential
- Commercial
- Industrial
- Agricultural
- Institutional
- Government
- Miscellaneous

Conservation Lands

- Florida Forever Lands
- FNAI Conservation Lands

Figure 19. The Proposed Suncoast Connector Project through Levy County, Cont.

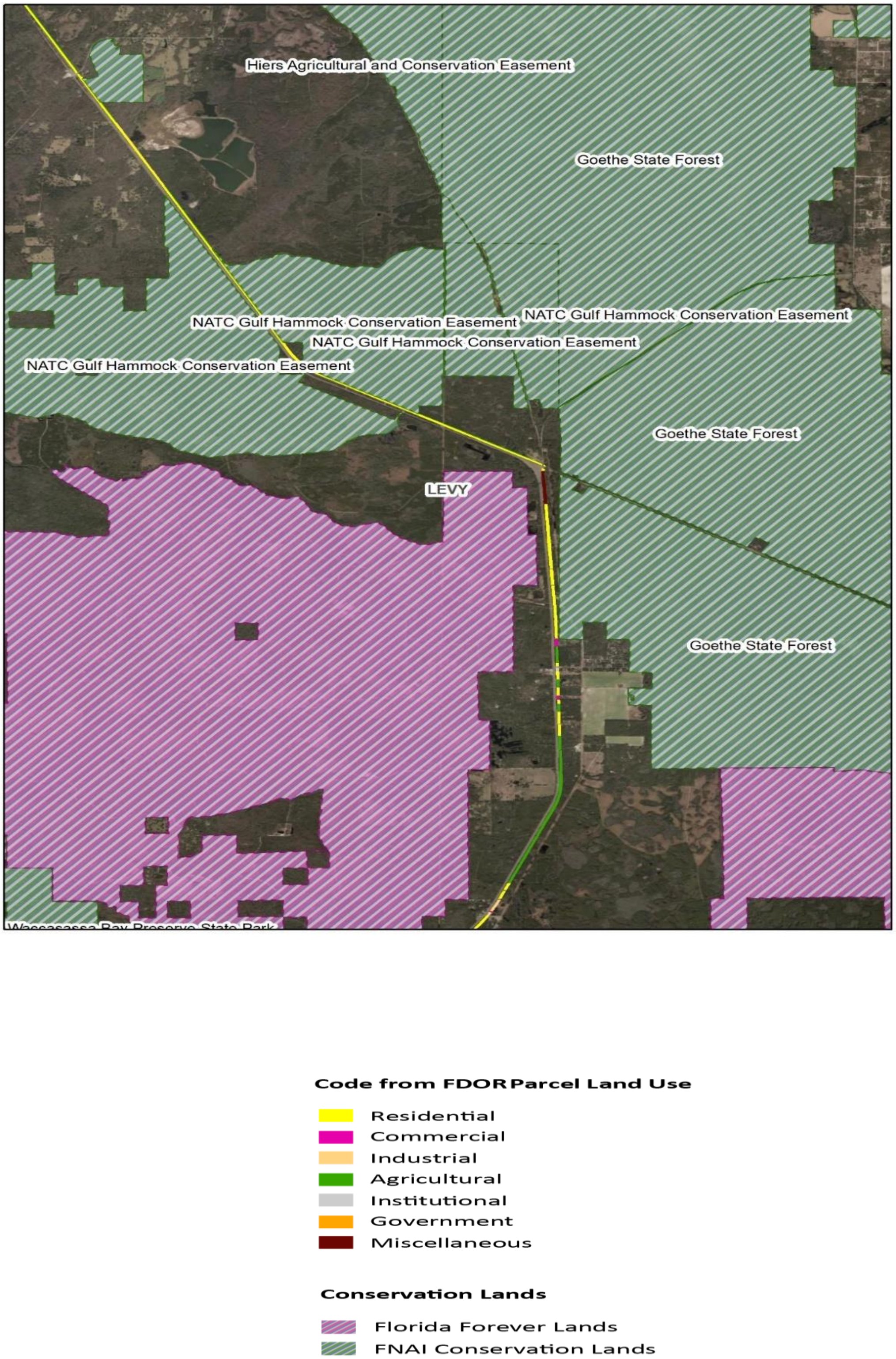


Figure 150. The Proposed Suncoast Connector Project through Levy and Citrus Counties

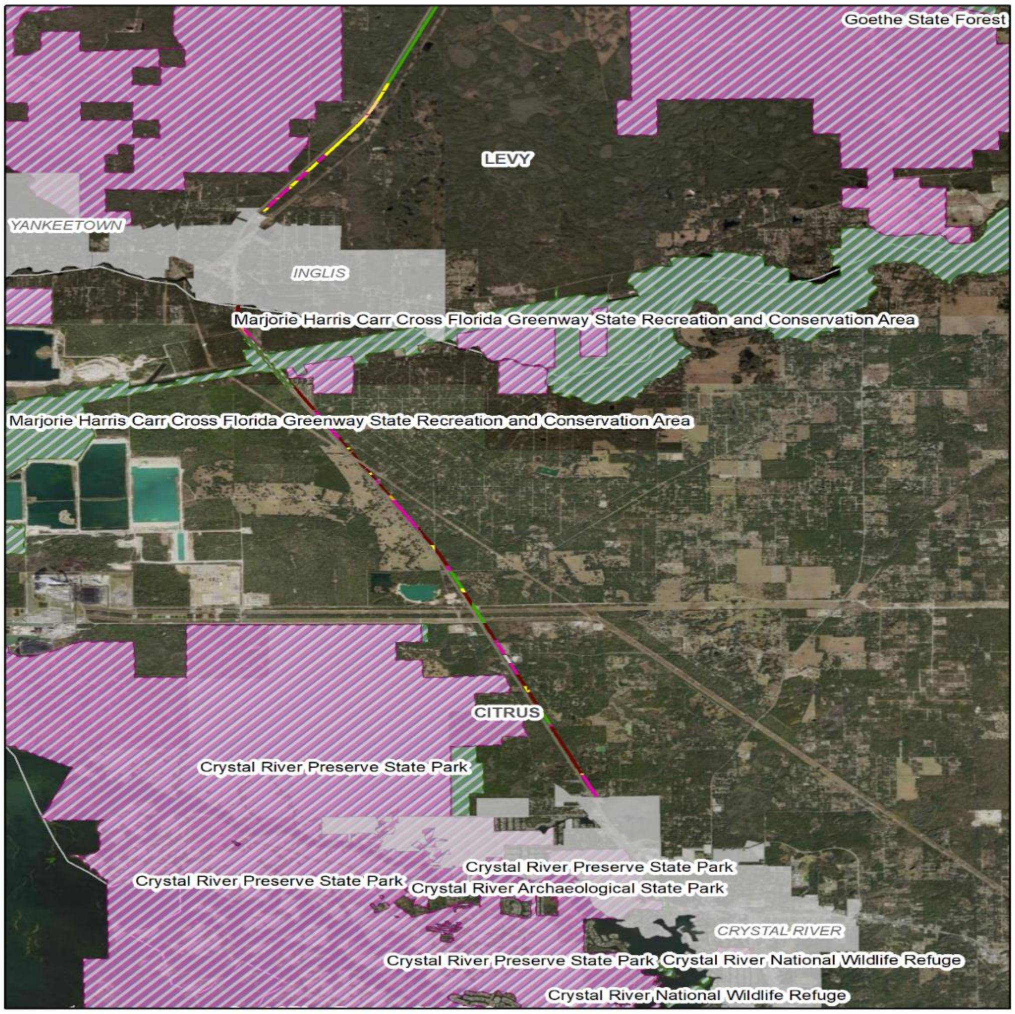


Figure 161. The Proposed Suncoast Connector Project Through Citrus County

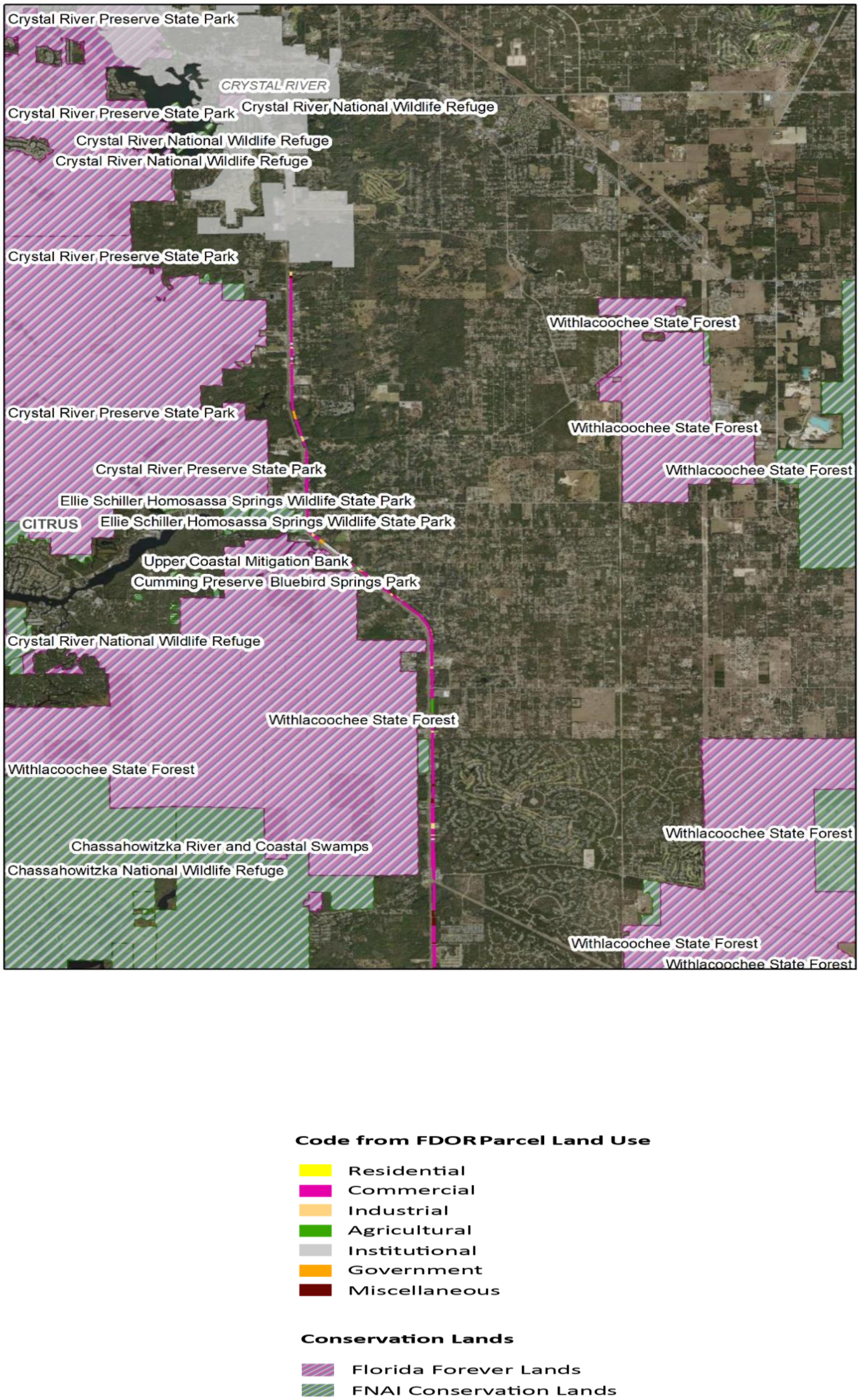
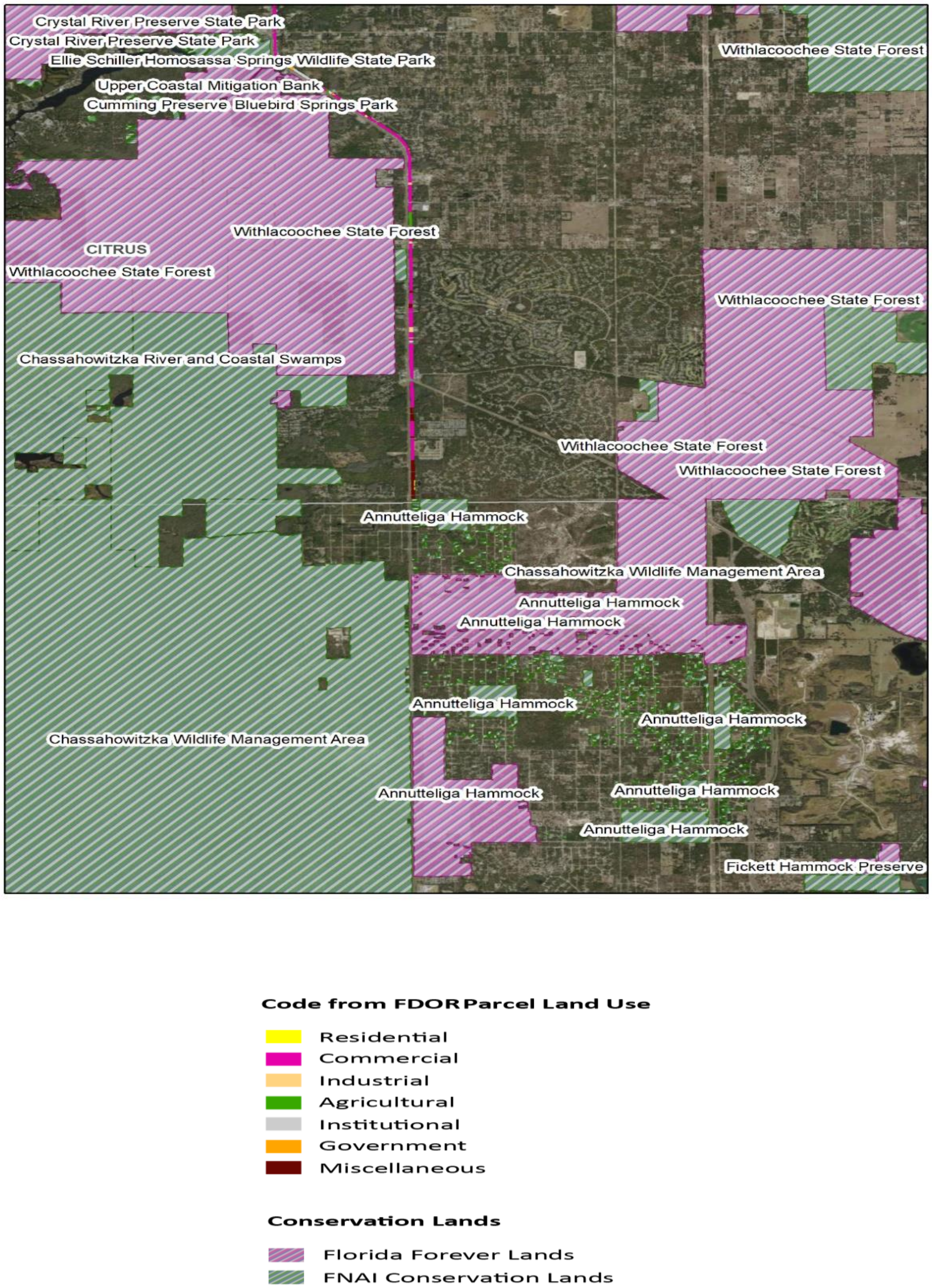
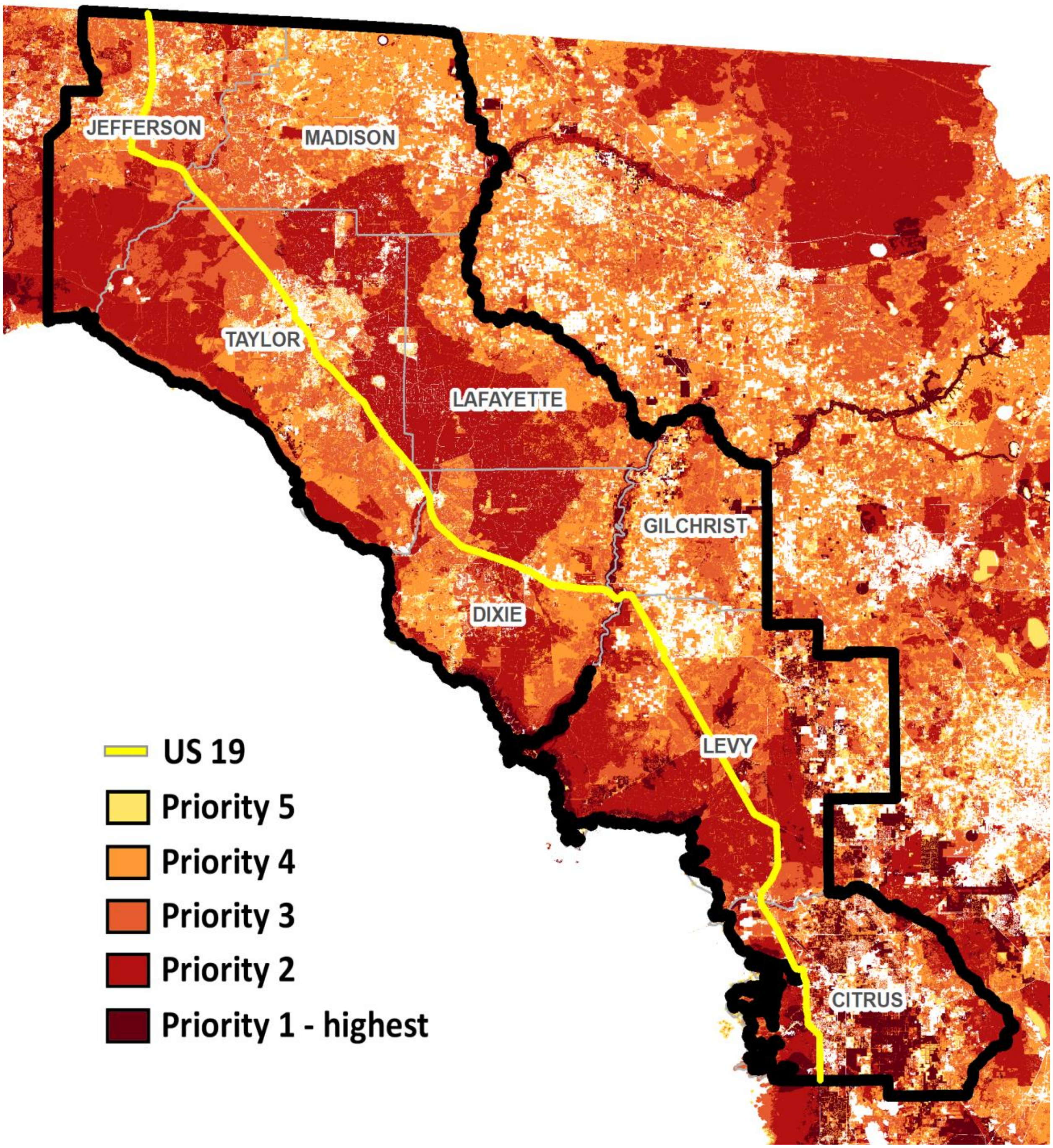


Figure 172. The Proposed Suncoast Connector Project through Citrus County, Cont.



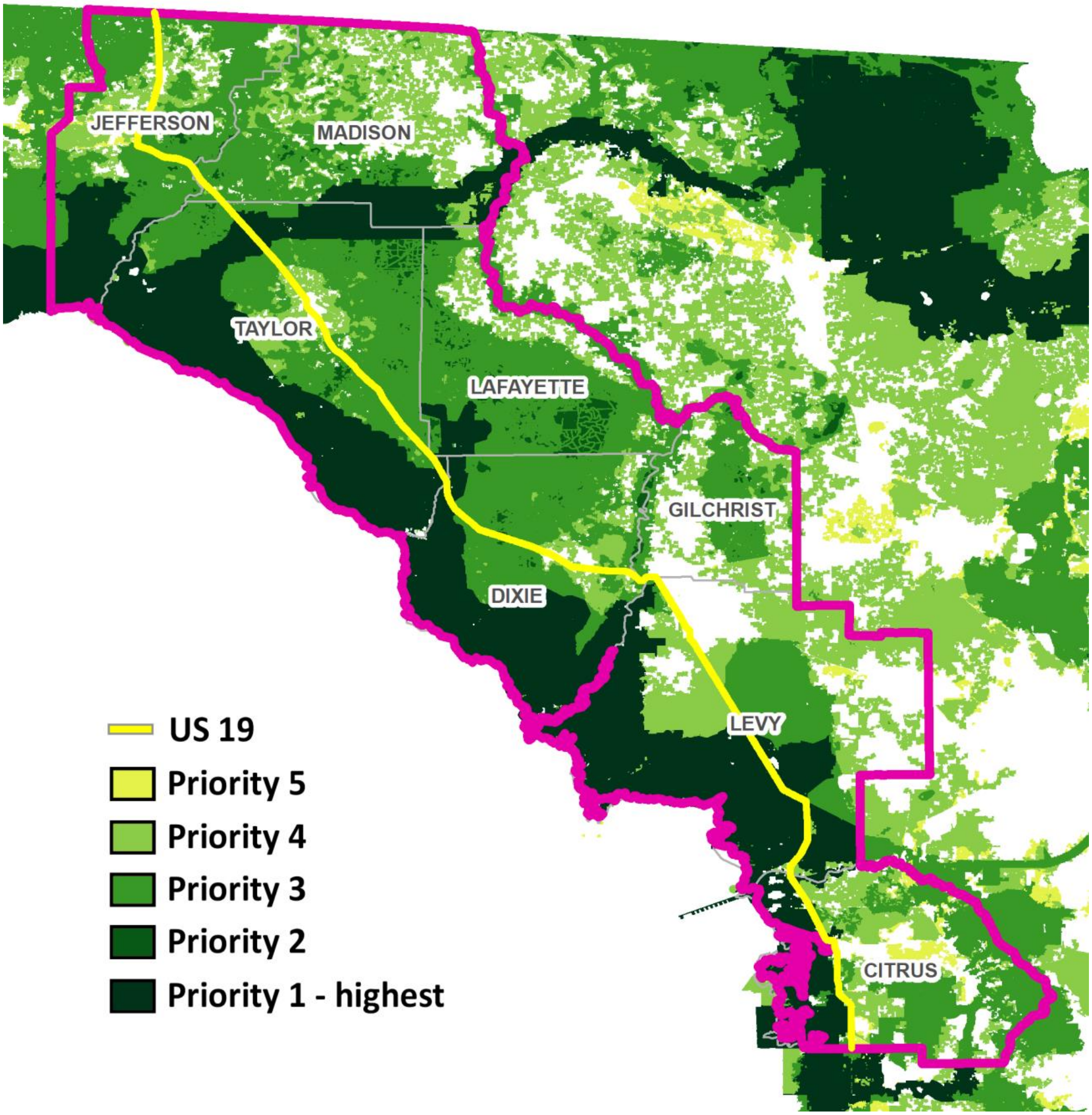
Biodiversity

Figure 183. Biodiversity Map of the Counties Associated with the Proposed Suncoast Connector Project



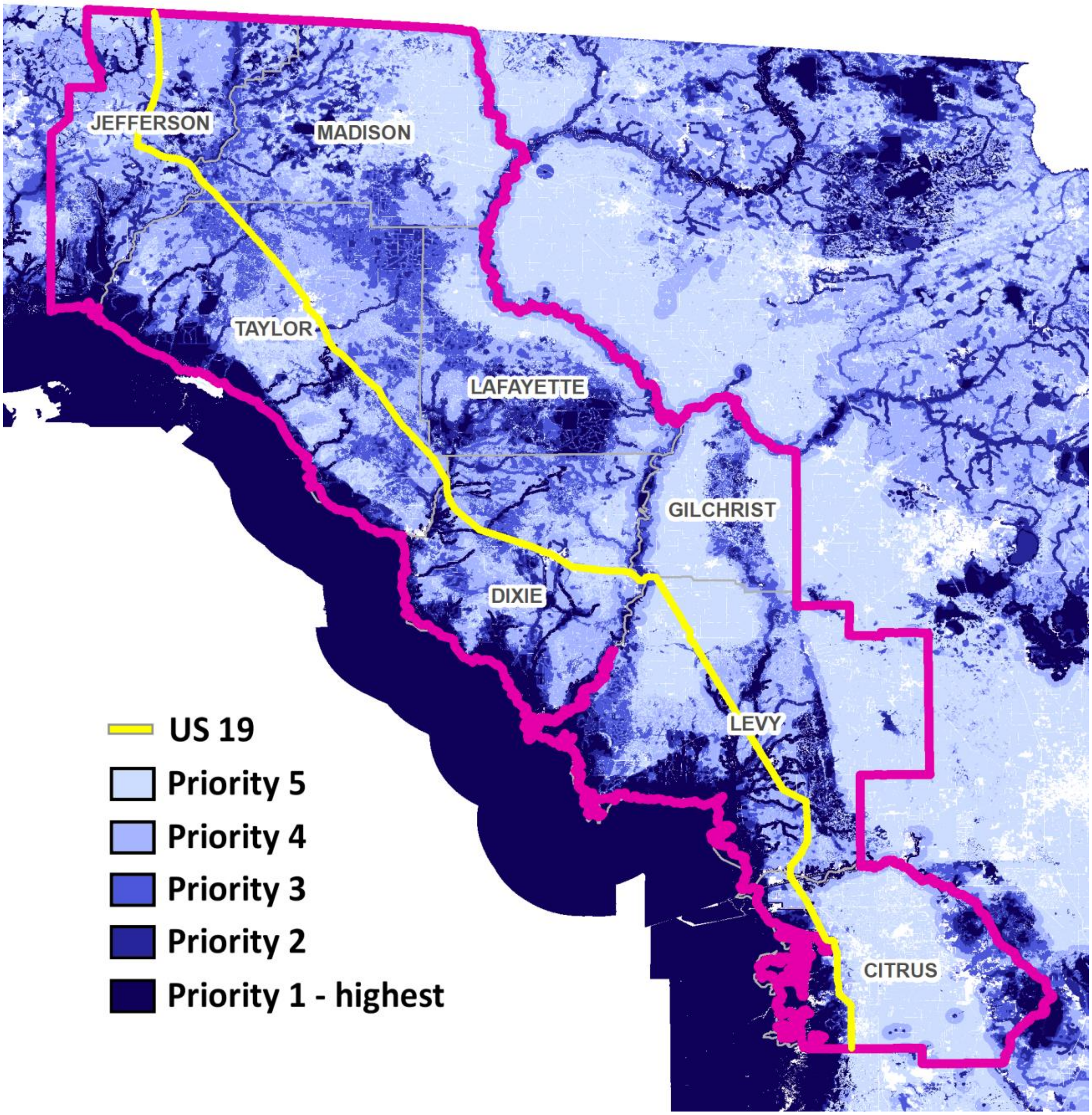
Landscapes with Natural Communities

Figure 194. Landscapes with Natural Communities Map of the Counties Associated with the Proposed Suncoast Connector Project



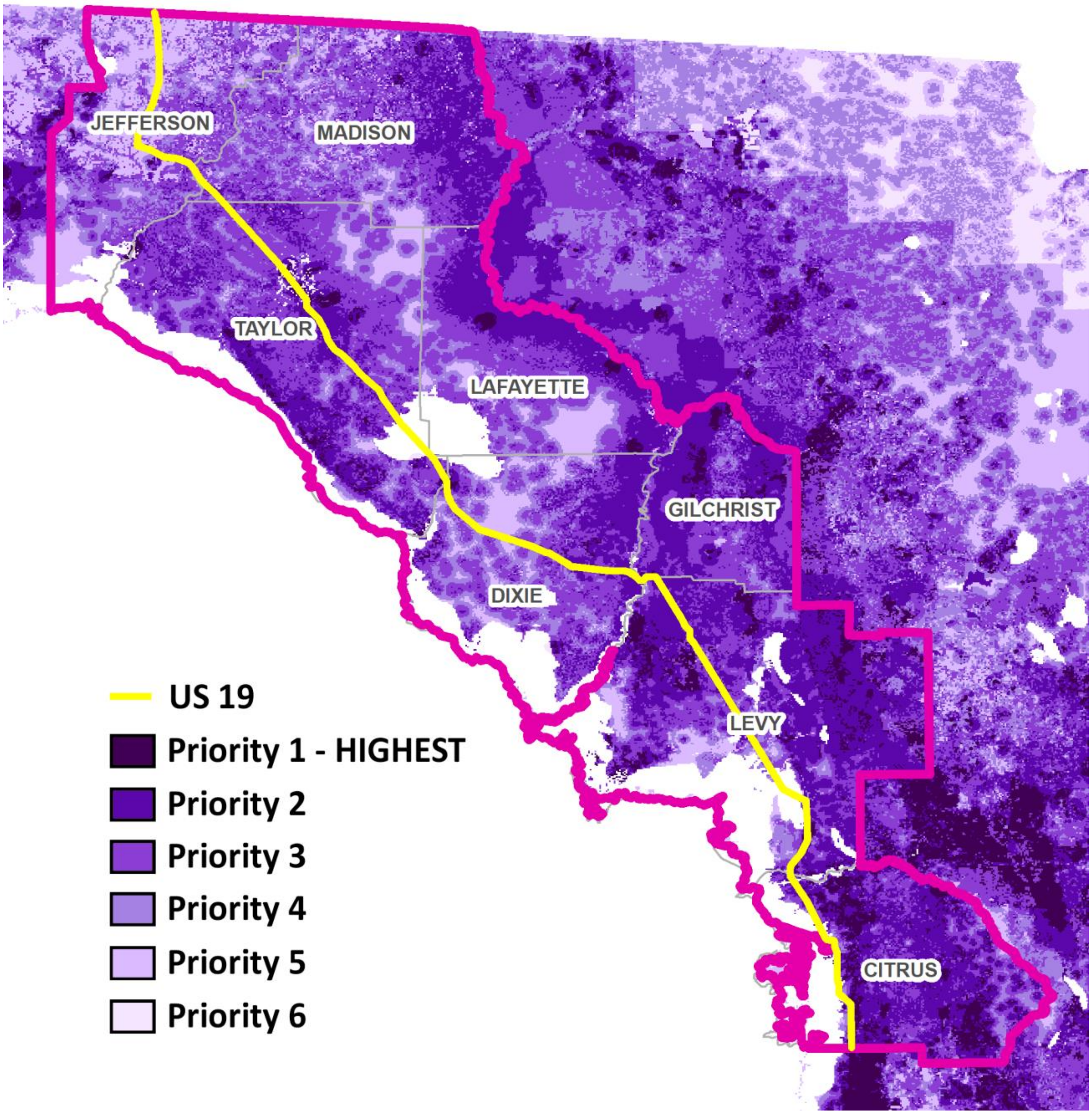
Surface Water

Figure 205. Surface Water Map of the Counties Associated with the Proposed Suncoast Connector Project



Aquifer Recharge (Groundwater)

Figure 26. Groundwater Map of the Counties Associated with the Proposed Suncoast Connector Project



Vulnerability Analysis Findings

As mentioned earlier, the objective in conducting a vulnerability analysis was to identify the areas that should be viewed with special consideration given their vulnerability assessment. The information is useful in prioritizing the areas of highest vulnerability along the proposed Suncoast Connector roadway throughout the eight counties.

To summarize, based on Figures 8 - 22, the Suncoast Connector will be expected to impact the following vulnerable lands:

- Figure 8: Jefferson County – Through Monticello Ecological Park
- Figure 19: Jefferson & Taylor County – Along Oakhill Conservation Easements
    - Mount Gilead Conservation Easement
    - Lick Skillet Conservation Easement
    - Near Middle Aucilla Conservation Easement and Area
- Figure 10: Taylor County – Through Ecofina Conservation Area
- Figure 11: Taylor County - Forest Capital Museum State Park
- Figure 13: Dixie County - Cuts Through Upper and Lower Steinhatchee Conservation Area
- Figure 15: Dixie County - Next to Nature Coast Trail in Cross City
- Figure 16: Dixie, Levy & Gilchrist Counties – Through Wannee Conservation Area & right through Fanning Spring State Park
- Figure 17: Levy & Gilchrist Counties – Near Yellow Jacket Conservation Area & Andrews Wildlife Management Area & Fowler's Bluff Conservation Area
- Figure 18: Levy County – Next to Waccasassa Conservation Area
- Figure 19: Levy County – Right through NATC Gulf Hammock Conservation Easement & directly brushes along Florida Forever lands & the Goethe National Forest lands.
- Figure 20: Levy and Citrus Counties – Through Marjorie Harris Carr Cross Florida Greenway State Recreation & Conservation Area and next to Crystal River Preserve State Park (Florida Forever lands).
- Figure 21: Citrus County – Continues along Crystal River Preserve State Park and next to Upper Coastal Mitigation Bank, Cumming Preserve Bluebird Springs Park, Withlacoochee State Park (Florida Forever lands), and next to Chassahowitzka River & Coastal Swamps (FNAI Conservation lands).
- Figure 22: Citrus County – Cuts through Chassahowitzka River & Coastal Swamps and Annulteliga Hammock (Florida Forever lands).

Concerning Figures 23 – 26, which were constructed using the natural resource data, or the CLIP map layers, the following counties and associated priority levels can be observed to be the greatest at risk (or most vulnerable). Further detail in terms of the CLIP map layer methodology and Priority Level definitions may be found at the following weblink: See: https://www.fnai.org/pdf/CLIP_v4_user_tutorial.pdf

- Figure 23: **Biodiversity Resource Priorities**: Most at risk are Citrus and Levy Counties (with about 50 percent Priority 2 Levels). Citrus County also include some Priority 1 Level areas. It should be noted that the highest priority areas (e.g. 1 & 2) indicate the rarest of most vulnerable species but all priority levels have conservation value.
- Figure 24: **Landscape Resource Priorities**: Citrus County is comprised of all Priority 1 & 2 areas, and it should be observed that Levy County is at least 50 percent Priority 1. Priority 1 indicates a "Greenways Critical Linkage" area. The rest of the counties north to Jefferson County are Priority Levels 2 and 3, indicating they have Landscape Integrity values of 10 and 9, respectively.
- Figure 25: **Surface Water Resource Priorities**: For Citrus County, the Suncoast Connector can be expected to skirt along at least 60 percent of Priority 1 & 2 Levels. For Levy County, the Suncoast Connector can be expected to cut through all the Priority 1 tributaries in the county. It will have a detrimental impact on these highly sensitive and vulnerable waterways draining to the Gulf. For Dixie and Taylor Counties, the Suncoast Connector would also cut through Priority 1 and 2 tributaries. The same would be the case for Jefferson County, although it will be across one Priority 1 or 2 waterway. The Priority 1 and 2 Levels indicate that the Surface Water is a Floodplain and Wetlands Priority 1 and 2, respectively.
- Figure 26: **Aquifer Recharge (Groundwater)**: For Citrus, Levy, Dixie and Taylor Counties, they appear to contain a large percentage of Priority 1 and 2 Levels of Groundwater, with Jefferson County to a lesser extent. Priorities 1 and 2 indicate the highest potential for recharge to springs or public water supplies.

8. Conclusions

Earlier this year, the Florida Legislature approved the construction of three toll roads that would span more than 300 miles across Florida. One of these roads is the Suncoast Connector Toll Road, which is proposed to extend more than 150 miles from Citrus County to Jefferson County in the Red Hills. The Red Hills region is one of the most ecologically significant areas of the Gulf Coastal Plain. Significant investments in private and public conservation efforts have protected over 40 percent (200,000 acres) of the Red Hills landscape. The Red Hills contains some of the last remnants of the nation's longleaf pine forests, numerous imperiled species, and critical water resources including the Floridan Aquifer and the watersheds of several designated *Outstanding Florida Waters* that feed into and protect highly productive Big Bend coastal waters.

On the path northward, this study assumes the proposed toll road would follow a similar path as the current US19, and pass from Jefferson to Citrus County, through the Big Bend counties of Levy, Dixie, Taylor, Jefferson, Citrus, Gilchrist, Lafayette, and Madison. These working rural communities comprise the core of the longest stretch of undeveloped coastline in the continental United States. The Big Bend also includes some of the most heavily forested areas in Florida's "wood basket", which in turn support the health of rivers, creeks, springs and estuaries, protecting one of the world's most productive commercial and recreational fisheries on the Gulf Coast.

Tall Timbers commissioned the FSU Center for Economic Forecasting and Analysis to conduct an economic impact study of the proposed Suncoast Connector Toll Road in the eight county Big Bend Region in Northwest Florida. One of the goals of the project is to provide Tall Timbers with a comprehensive economic study that fully documents the long-term economic impacts of the region as a result of the Suncoast Connector project.

This economic analysis study is comprised of the following: The literature review is divided into: the general impact and local area impact studies, and the environmental studies on water, air, and biodiversity, respectively. Next, economic demographics and methodology are presented, followed by an economic impact analysis and results. The economic impact analysis examined both the long-term impacts of bypassing the four primary towns along the projected Suncoast Connector route, and an analysis of impacted properties in the eight-county area. It is noted that none of the specifics on a planning trajectory concerning the Suncoast Connector construction is known as of yet, let alone specifics on cost. Therefore, the following economic analyses must be viewed as a rather preliminary attempt to map costs on this rather sizable project.

General Economic Impact of the Suncoast Connector Toll Road

Public capital investment projects are conducted for different reasons; e.g., need, economic benefits of use, and impact of construction.

- Regarding the need factor, it is noted that a toll road is not needed from a transportation perspective as US19, for much of its path north of Citrus County, operates at only 16% of its maximum capacity. Thus, need has not been demonstrated for the major stretch of the potential trajectory of the toll road.
- Local need for a new Suncoast Connector is probably rather low as well.
- A recently released TaxWatch study found that the Suncoast Connector is a risky project with a likely large price tag and little demonstrated transportation need. Complicating the process is that the project is moving forward while COVID-19 has the state facing major reductions in government revenue-including gas taxes and tolls.[85]
- A potential marginal benefit, of using a new constructed Suncoast Connector road, is levied away with a toll, reducing its potential use (as there is the alternative of using US19).
- Public capital projects nowadays have significantly lower economic impacts than similar projects in the past. Mean rates of return to highway capital across state-level studies are close to zero. Amongst others: "Finding the case for more government investment is significantly weaker than commonly asserted" (Bourne, 2017), "Job creation is no slam dunk", and "spending on infrastructure can easily be wasted" (Schmitt, 2017).
- Public capital projects have greater economic impact on the Federal level than they do on the State level, and ultimately County levels (due to leakage of impacts outside smaller defined areas, and with highway capital scoring being rather low to begin with).
- Rural interstate and off-interstate counties seem to exhibit few positive effects, while negative effects are numerous. Overall, there are no permanent local Gross Regional Product (GRP) effects.
- There is direct and permanent loss of land as input for natural resource production. This loss will be in excess of necessary land to be used for construction, due to indivisibilities and sustenance, as well as land buffers in-between to prevent pollution from entering the food chain and ecosystem.
- Potentially part of the land lost will be in areas where the government has already spent millions to preserve natural conditions.

[85] Florida TaxWatch, Florida TaxWatch Report, July, 2020. Retrieved from: https://floridataxwatch.org/Research/Full-Library/ArtMID/34407/ArticleID/18903/The-Suncoast-Connector-What-We-Still-Need-to-Know

Long - Term Economic Impacts of the Suncoast Connector Toll Road

If the Suncoast Connector were to bypass the towns of Perry, Monticello, Chiefland, and Cross City, there would be some expected revenue (and job) losses to these towns. Based on a conservative long-term cost approach, the following economic impacts were derived using IMPLAN economic modeling software.

Table ES1. Total Long-Term Economic Impacts Loss Based on Suncoast Connector Bypassing Perry, Monticello, Chiefland, and Cross City Florida (2020$)

County	Output	Jobs	Income
Perry	$12,024,783	124	$3,557,043
Monticello	$2,128,231	25	$738,007
Chiefland	$12,017,524	134	$3,446,917
Cross City	$1,844,315	21	$645,487
Total	**$28,014,853**	**304**	**$8,387,454**

As shown in Table ES1, the total expected economic long-term losses due to the proposed Suncoast Connector road project are estimated to be $28 million in total economic output (sales/revenues), 304 jobs, and $8.4 million in income. Both Perry and Chiefland sustain larger losses in terms of $12 million each in output, and about $3.5 million each in income, and 124 and 134 in projected job losses, respectively.

Other Economic Impacts of the Suncoast Connector

- There may be an accessibility premium reflected in higher land prices, and higher house prices. However, this will only be the case in optimal conditions, and where housing becomes available within a range from employment centers (cities >25,000 residents). Equally there may be negative externalities (*i.e.* lower property values) due to traffic intensity, and noise pollution. A real local issue is accessibility to the "other side" of the toll-road, necessitating permanent detours, and hampering local economies.
- Highway bypasses will impact local businesses, *i.e.*, the local economy will undergo structural changes. "About three-fourths (76%) of the firm representatives thought their retail sales would have been higher … if the bypass had never opened." (Babcock, 2003)[86]
- Adjustments will especially be seen with tourism-oriented businesses, where traditional recreation may see declines of up to 50 percent. U-shape local market adjustment seems applicable, with phasing often stretching over a decade (building or enticing new user market segments).

[86] Babcock M.W., and J.A. Davalos, "Case Studies of the Economic Impact of Highway Bypasses in Kansas", Journal of the Transportation Research Forum, 2010. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.353.4113&rep=rep1&type=pdf

- Local employment will see frictions, and adjustment will take time. It is estimated that the bypass of e.g. Perry, Monticello, Chiefland and Cross City, will cost a significant loss of over 300 permanent full time equivalent (FTEs) Jobs.
- Social exclusion will probably enhance, as more people will drive by rather than stop for a detour from a new toll road, than from the present US19.

Vulnerability Analysis of the Suncoast Connector Toll Road

This study also examined and identified the areas that should be viewed with special consideration given their vulnerability assessment, using Geographical Information Systems (GIS). The information is useful in prioritizing the areas of highest vulnerability along the proposed Suncoast Connector roadway throughout the eight counties.

In the first grouping of GIS Figures in this study, the Suncoast Connector is represented by land use categories (e.g., Residential, commercial, industrial, agricultural, institutional, governmental, or miscellaneous), and also includes Florida Forever and Florida Natural Areas Inventory (FNAI) Conservation Lands map layers. In the subsequent five Figures, the outline of the Suncoast Connector overlays the Critical Lands and Waters Identification Project (CLIP) map layers. CLIP is an organized set of natural resource data layers that are combined into five resource categories: biodiversity, landscapers, surface water, groundwater, and marine. Using an aggregated CLIP model, these five natural resource data layers are further differentiated by five priority levels for natural resource conservation.

To summarize, the Suncoast Connector will be expected to strongly impact the following vulnerable lands:

- In Jefferson & Taylor County – Along Oakhill Conservation Easements, Mount Gilead Conservation Easement, Lick Skillet Conservation Easement, and near Middle Aucilla Conservation Easement and Area
- In Taylor County – Through Ecofina Conservation Area
- In Dixie County - Cuts Through Upper and Lower Steinhatchee Conservation Area
- In Dixie, Levy & Gilchrist Counties – Through Wannee Conservation Area & right through Fanning Spring State Park
- Levy County – Next to Waccasassa Conservation Area, and right through NATC Gulf Hammock Conservation Easement & directly brushes along Florida Forever lands & the Goethe National Forest lands.
- Levy and Citrus Counties – Through Marjorie Harris Carr Cross Florida Greenway State Recreation & Conservation Area and next to Crystal River Preserve State Park (Florida Forever lands).
- Citrus County – Continues along Crystal River Preserve State Park and next to Upper Coastal Mitigation Bank, Cumming Preserve Bluebird Springs Park, Withlacoochee

State Park (Florida Forever lands), and next to Chassahowitzka River & Coastal Swamps (FNAI Conservation lands). It is expected to cut through Chassahowitzka River & Coastal Swamps and Annulteliga Hammock (Florida Forever lands).

With respect to the next section of the vulnerability analysis, which were constructed using the natural resource data, or the CLIP, map layers, the following counties and associated priority levels can be observed to be the greatest at risk (or most vulnerable):

- **Biodiversity Resource Priorities**: Most at risk are Citrus and Levy Counties (with about 50 percent Priority 2 Levels). Citrus County also include some Priority 1 Level areas. It should be noted that the highest priority areas (e.g. 1 & 2) indicate the rarest of most vulnerable species but all priority levels have conservation value.
- **Landscape Resource Priorities**: Citrus County is all Priority 1 & 2 areas, and it should be noted that Levy County is at least 50 percent Priority 1. Priority 1 indicates a "Greenways Critical Linkage" area.
- **Surface Water Resource Priorities**: For Citrus County, the Suncoast Connector can be expected to skirt along at least 60 percent of Priority 1 & 2 Levels. For Levy County, the Suncoast Connector can be expected to cut through all the Priority 1 tributaries in the county. It will have a detrimental impact on these highly sensitive and vulnerable waterways draining to the Gulf.
- **Aquifer Recharge (Groundwater):** For Citrus, Levy, Dixie and Taylor Counties, they appear to contain a large percentage of Priority 1 and 2 Levels of Groundwater. Priorities 1 and 2 indicate the highest potential for recharge to springs or public water supplies.

Based on the vulnerability analysis findings, the research study team concurs with the following findings regarding the two recently released UF studies:

"This assessment of relevant GIS data on focal species, natural community, wildlife corridor, surface water resources, ground water resources, forest resources, and existing and proposed conservation lands shows that a new toll highway including a modified US19 corridor to accommodate a new highway would have very significant impacts on the ecological resources of what is currently one of the most rural regions with highest ecological integrity in Florida. There is no way to build a new or modified highway facility crossing most of this region without very significant impacts including to the habitat and wildlife corridors needed to support fragmentation-sensitive species, allow for coastal adaptation to sea level rise, maintain functional surface water hydrology for the many significant river systems, including the Suwannee River, that play an essential role in the ecological integrity of the coastal estuary of the Big Bend, which includes one of the biggest sea grass waterscapes in the United States. ""To minimize negative impacts within the study area, new infrastructure must be strategically located to direct growth in ways that considers both near term impacts on existing communities, agriculture, and natural resources, and reduces future vulnerability to storms and sea level rise. However, the probability of significant and irreversible change in the study area, coupled with a high degree of vulnerability to existing and future coastal hazards suggests that this region has low suitability for supporting the kind of new highway and infrastructure corridor proposed in the M-CORES project."

Environmental Impacts of the Suncoast Connector Toll Road

Some environmental impacts highlighted from the literature (unfortunately not monetized) are:

- Animal species will be at a disadvantage in landscapes with roads due to reduced population sizes (traffic mortality or roadkill) and reduced movement between complementary resources (because of fragmentation and isolation).
- There are effects of roads on ecosystems, including changes to hydrology and water quality, noise, and other atmospheric effects, as well as road-related mortality and barriers to animal movement, to population fragmentation and road avoidance behavior.
- There are effects of roads on major water quality parameters, namely: impacts on turbidity, total suspended solid (TSS), and total iron during construction, effects on chloride and sulfate during and after construction, and effects on acidity and nitrate after construction.
- During and after highway construction, the local air quality will be influenced by chemical pollutants such as "Volatile Organic Compounds" (VOCs) and "Nitrous Oxides" (NO_x) which will harm humans and animal species.
- There are substantial impacts on habitat losses for birds from new highway construction; fragmentation, disturbance, direct and indirect (habitat loss) mortality.
- Last but not least, there are effects of the Suncoast Connector on species biodiversity, as reduced flood zones will complicate biodiversity conservation and species resiliency.[87]

[87] Volk M.I., B.B. Nettles, and T.S. Hoctor, Vulnerability of the Suncoast Connector Toll Road Study Area to Future Storms and Sea Level Rise, University of Florida, April 2020

Limitations of the Study: In addition to precise location, and construction cost estimates (including a construction timeline), other environmental costs and benefits need to be considered. In general, rural interstate and off-interstate counties exhibit few positive effects from major road construction. Put differently, the mean annual rate of return to highway capital across state-level studies is close to zero. Accessibility may improve from the state perspective, at the same time this may be negative for rural and small communities. Neither is there a significant local employment impact. Admittedly travel time may improve, but will be relative, and which benefit may be set back by levying a toll. Finally, construction of the Suncoast Connector through the Florida coastline area, as described, will come at a high environmental cost, e.g. species mortality, severe impacts on ecosystems, fragmentation of landscapes, surface and groundwater pollution, loss of habitat and biodiversity, of which costs are to be determined.

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10. Appendix A

Economic Analysis of Properties Impacted in the Eight-County Area

The economic impact of the Suncoast connector is diverse. The analyses below are primarily an attempt to gauge the order of the impacts, while lacking important details. Overall, it is assumed that all entrepreneurial activities are conducted with commercial and industrial sustainability in mind. This principle invokes the ceteris paribus assumption, i.e. all other things being equal, as neither the future nor decision-making process is taking place during this study. At stake is an external impetus that forces the hand of entrepreneurs to reevaluate the going concern based on changed/changing circumstances. This in enforcing Eminent Domain, often at values rather short of market valuations, as the latter is no longer an option (i.e. by facing a 'fait accompli').

First there is a direct loss of land where the road is to be build. This can be determined by taking an estimate on the length of the stretch, and width of the road. In the analyses it is assumed that the Suncoast connector will follow the trajectory of the US19, with a total length of about 174[88] miles. Next, it is assumed that the width, including the shoulders, will comprise approximately 250 feet. This results in a total direct land-loss of 5,259 acres. By drawing a line in the sand, for construction, it is important to realize that land availability does not match the need, as the line will cut across parcels and properties. As a proxy to calculate additional lands needed and impacted, a database was set up by the research team based on data extracted by FREAC's Dr. Georgiana Strode, from the Department of Revenue "NAL"property tax data,[89] parcels crossing the virtual line of the 250-foot buffer adjacent to the present US I-19. Parcel parts inside the buffer are compared to the direct lost acres, where acres outside the buffer were subjected to a decision on potential future use; especially for land categories (1) Natural (excl. open water), (3) Pasture and (4) Intensive Agriculture. The following Table provides a categorized summary of Department of Revenue (DOR) Use Codes, Just Values, Square Footage, Acres, and Value per Acre. With (2) Semi-Natural, it is assumed that a split doesn't impact the use, and with (5) Residence, Commerce, and Industrial Development, average parcel sizes will be used.

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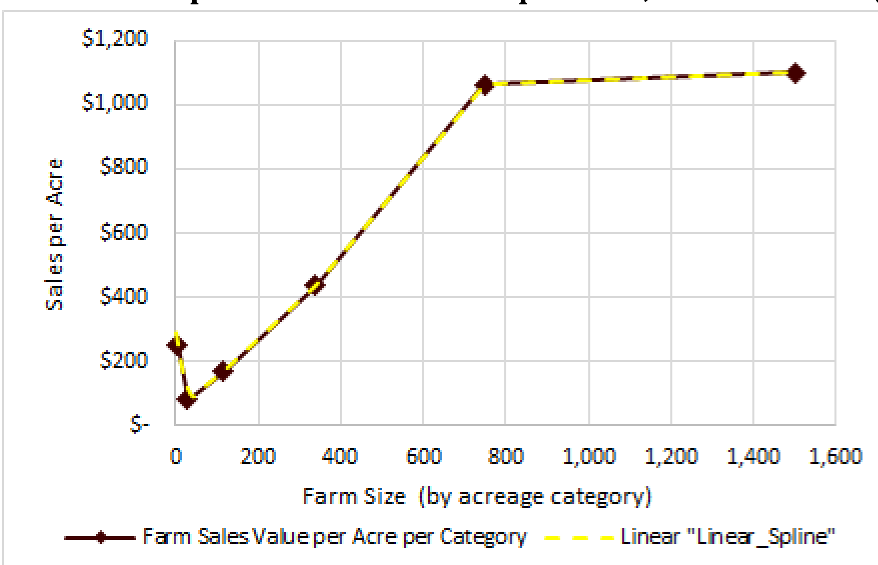
[88] Exact miles = 173.55.
[89] See: ftp://sdrftp03.dor.state.fl.us/Tax%20Roll%20Data%20Files/2018_NAL_SDF_NAP_Users_Guide/

Table 11. Re-categorized Summary of DOR-Use Codes, Total Just Values, and Acre Values for the Suncoast Connector Area (in $2020) [90]

Code	DOR-Land Use Category	Just Value	Land_Sq. Ft	Acre	$ / Acre
1	Natural (excl. open water)	$3,218,427,608	88,711,765,543	2,036,822	$1,580
2	Semi-Natural	$1,167,923,496	6,332,439,670	145,393	$8,033
3	Pasture	$1,379,734,456	15,979,803,798	366,896	$3,761
4	Intensive Agriculture	$1,047,992,324	15,090,929,497	346,488	$3,025
5	Residence, Commercial, Industrial Development	$19,659,311,507	40,987,598,421	941,075	$20,890
	TOTAL	$26,473,389,390	**167,102,536,929**	**3,836,674**	$6,900.09

In making decisions on parcel, or better operational splits, the next figure may be more indicative on how to better interpret divisions. The following Figure shows the combination of two distributions, e.g., farms by size, and farms by value of sales, where sales is a weighted average, and value is expressed by acre (not size category), for the purpose of differentiating divisions.[91]

Figure 27. Relationship Between Farm Sales per Acre, and Farm Size (in $2020)



A couple of observations can be made. First, the farms' population includes both farm categories: "Crops, including nursery and greenhouse crops", and "Livestock, poultry, and their products". It is not a stretch to assume that intensive agriculture is done on smaller farms, where extensive ranching is done at larger farms. The former would be to the left in

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[90] Prices are updated from 2019 to 2020 dollar values using the Oregon State University conversion factors, retrieved from: http://liberalarts.oregonstate.edu/spp/polisci/research/inflation-conversion-factors. https://liberalarts.oregonstate.edu/spp/polisci/faculty-staff/robert-sahr/inflation-conversion-factors-years-1774-estimated-2024-dollars-recent-years/download-conversion-factors

[91] Both distributions are taken from Table 1. County Summary Highlights: 2017, pp. 236-247, Census of Agriculture 2017, Florida and County Data, Volume 1 – Geographic Area Series – part 9, Issued April 2019. Retrieved from: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf

the Figure above, and the latter to the right. In the middle part of the graph, there is an issue of efficiency.

With small crop farms (<30 acres), a split according to the slope will increase the sales on its parts, which will not materialize given that the intensiveness depends on soil quality. A split may not be compensated for by readily available lands. For larger ranch-farms an acre might not be that harmful, given the horizontal slope leading to next to no loss (that is at least on an acre-to-acre basis). In the downward sloping part or range of farm sizes, the sum of sales on two parts (depending on how the farm is split) may be less than the sales on the original sized parcel (e.g. sales of a farm with 600 acres will be approximately $834.09 per acre or $500,452 in total (600 x $834.09), whereas sales of two farms at 300 acres each will be approximately $389.87 per acre or $233,923 in total (300 x 2 x $389.87).

In applying this principle, while making subjective decisions (using e.g. >20% in buffer land-loss) as detrimental for a farm to operate hence seizing operations (and assuming that <20% land-loss is somehow recouped by lands becoming available in close proximity as replacement acres), the following Table 12 was derived (using the same five land categories as above).

Table 12. Direct and Indirect Acres at Stake, by Selective Counties, and Land-Use Use

County	Direct land loss acres	(1)			(2)	(3) & (4)			(5)	Total land loss acres
		Sub-total	within buffer	over buffer		Sub-total	within buffer	over buffer		
Dixie	**740.1**	512.7	293.3	**219.4**	**16.9**	49.2	13.4	**219.4**	**161.4**	**1,357.3**
Citrus	**570.5**	26.8	11.9	**14.9**	**63.5**	82.5	10.8	**14.9**	**397.8**	**1,061.7**
Gilchrist	**62.2**	27.6	-	**27.6**	**2.1**	22.2	3.3	**27.6**	**10.4**	**129.8**
Levy	**1,435.3**	660.1	165.4	**494.7**	**71.8**	298.7	44.2	**494.7**	**404.7**	**2,901.2**
Taylor	**1,017.7**	715.6	200.8	**514.8**	**16.2**	63.7	37.7	**514.8**	**222.2**	**2,285.8**
Jefferson	**1,433.2**	686.4	225.1	**461.2**	**61.2**	487.0	128.0	**461.2**	**198.7**	**2,615.5**
Total	**5,259.1**									**10,351.2**

It is noted that neither Lafayette nor Madison County is listed in the table, given that the present US19 trajectory is assumed. A different trajectory will, from the analytic perspective result in a redistribution, as different values will have to be applied. Not having any further information, however, handicaps this analysis (hence, the results are to be valued on the assumptions made). In the first column of the table, the direct land loss due to Suncoast connector construction is provided (note: including the 250-foot buffer). Columns with the four headings (1,2,3 & 4) per land use category will add up to these direct land losses. In addition, there are parts of parcels over and above the buffer that, to the judgment of the research team, will cease to be used for the present purposes. Any decision(s) made on these parts are derived decisions or opportunities that were not further analyzed.

The next step was to find values, in which several issues play a role, and where some issues are recognized but deemed to be difficult to value. With Category (1) Natural (excl. open water), a simple weighted average on property just value (DOR data) is used per the assigned code, and specific per county. The research team was unable to assign 'splits' and associated impacts to logging activities/businesses, nor is any information available on capital assets used per natural lands other than the land values themselves. Thus, there are some undetermined costs. Perceiving the values themselves as capital assets to some degree, it is assumed that there is a depreciation for which 14.3 percent was chosen (i.e. a seven-year replacement). The next step accounted for the acreage lost in perpetuity, the result is multiplied 1/interest (i.e. 1/0.0125 for 30-year Government bonds).[92]

Category (2) Semi-Natural land is similarly elusive with respect to activity/business, further assets, and consequences of 'split-ups'. This category is treated the same as category (1).

Categories (3) Pasture and (4) Intensive Agriculture, will be treated simultaneously, as farms are involved. The denominator for analyses is number of farms. The analyses and subsequent decision-making lead to a total of 27 farms being closed (based on buffer acreage, and 'unfavorable area splits'), involving some 154 acres in total. To evaluate the loss of capital, the average "estimated market value of land and buildings", and "estimated market value of all machinery and equipment", specific per county, were used.[93] Land and buildings are depreciated at the same rate, namely 5 percent (or 20 years), and machinery and equipment at 14.3 percent (as 7-year properties).[94] The results are again multiplied by 1/interest (i.e. 1/0.0125 for 30-year Government bonds), as losses in perpetuity. Since livestock is a capital asset as well, further specific analyses are needed, but for now the research team assumed a conservative $10 million. A factor equally important, but of a different order, is farm sales revenues. For farm sales revenues, a weighted average between "Market value of agricultural products sold", "Government payments" , and "Total income from farm-related sources"[95] is used, and multiplied by the number of closed farms. The result is multiplied 1/interest (i.e. 1/0.0125 for 30-year Government bonds), as this revenue is also lost in perpetuity.

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[92] Rate taken from https://www.Bloomber.com/markets/rates-bonds/government-bonds/us

[93] It is noted that only averages are available. Ibid Table 1. County Summary Highlights: 2017, pp. 236-247, Census of Agriculture 2017, Florida and County Data, Volume 1 – Geographic Area Series – part 9, Issued April 2019. Retrieved from: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf

[94] See Internal Revenue Services, Publication 946, Cat. No. 13081F, How to Depreciate Property, for use in preparing 2019 returns. Table B-1. Table of Class Lives and Recovery Periods. Retrieved from https://www.irs.gov/pub/irs-pdf/p946.pdf

[95] Ibid Table 1. County Summary Highlights: 2017, pp. 236-247, Census of Agriculture 2017, Florida and County Data, Volume 1 – Geographic Area Series – part 9, Issued April 2019. Retrieved from: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf

Category (5) is different with respect to analyses as both “Residence, Commercial, and Industrial Development” is involved. Only a reference acreage (to be lost) is known. Using a weighted average acreage per parcels, the number of 235 parcels was determined. Next, a weighted average value was calculated (Category 5 across residential, commercial, industrial, institutional other categories), specific per county. Overall, residential properties weighted in 82.9 percent, commercial and industrial properties 5.4 percent, and other categories in total 11.7 percent (though county-specific percentages were used). Relating to depreciation, residential properties have a useful life of 27.5 years (3.36 percent), while commercial properties can be depreciated over 39 years (2.56 percent). Given that no depreciation is available for the remainder categories, the weighted average between the two main categories are used as the base. The results are again multiplied by 1/interest (i.e. 1/0.0125 for 30-year Government bonds), as the specific use is lost in perpetuity. Last in category (5) some estimated 17 commercial and industrial properties are subject to closure, where these businesses obviously incur sales revenues. These revenues also are lost in perpetuity. No value could be assigned, thus there is additional loss, but the scope cannot be determined, or needs as of yet to be determined.

The results of the direct losses due to the construction of the Suncoast Connector toll road are provided in Table 13.

Table 13. Losses in Assets, and Revenues, by County and Land-Use (in $2020)

	Loss in Productive Assets				Loss in Revenue # Businesses	
Categories / counties	(1)	(2)	(3-4)	(5)	(3-4)	(5)
Dixie	$9,633,063	$1,595,041	$27,615,302	$8,083,901	$47,527,112	1
Citrus	$3,092,214	$9,640,336	$11,101,846	$153,784,809	$13,055,295	7
Gilchrist	$1,063,339	$155,022	$4,383,462	$1,572,730	$18,226,347	1
Levy	$15,720,828	$5,099,951	$32,095,706	$34,763,183	$116,365,407	3
Taylor	$6,964,979	$1,936,019	$4,486,204	$12,556,821	$7,128,601	1
Jefferson	$13,139,123	$3,263,780	$82,992,606	$30,955,328	$103,906,375	4
Sub-totals	$49,613,546	$21,690,149	$162,675,126	$241,716,772	$306,209,137	17
Total	$475,695,594				$306,209,137	17

From the table it can be understood that for the purpose of the Suncoast Connector construction, an estimated $475.7 million is lost in productive assets (sum of the first four columns in Table 13). At the same time, some $306.2 million is lost in revenue, not counting the sales of some additional 17 commercial and industrial businesses.[96] These results cannot

[96] It is noted that the two values mentioned cannot be added as they stem from two different sides of a financial report.

be seen apart from the mentioned undetermined losses on assets (buildings, machinery, and equipment) in (1) Natural (excl. open water), and (2) Semi-Natural land categories, nor from loss of inventory, machinery, and equipment in (5) Residence, Commercial, and Industrial Development, land uses, this especially concerning the estimated seventeen businesses to close shop. The indirect and induced economic impacts, including jobs were not included, as they too are lost in perpetuity. New decision making on the one hand and entrepreneurial endeavors on the other hand do not fall under the going concern premise, as opportunities emerge only under changed circumstances. As stated earlier, the prospects to readjust may be slim as markets take time to adjust (U-shape), especially in small communities with low diversity.

For comparative purposes, if the same calculus is applied to the Suncoast Connector, with estimated construction cost of $6.7 billion, this would result in $15.3 billion in perpetuity.[97] Although the $475.7 million seems small as compared to $15.3 billion, given the already low marginal returns on Public Capital of 2.6 percent (see Table 1) the estimated 3.1 percent (=$475.7M/$15.3B) loss is significant! In principle, the Suncoast construction runs at a loss (2.5%-3.1%=-0.6%) already. When indirect and induced effects are added in to both Suncoast Connector construction and local economic losses as indicated, the marginal rate of loss on the Suncoast Connector will further increase as multipliers on road construction underperform with regard to multipliers to be applied to local economies.

Conclusions

Costs must be included on the estimated loss of land uses as a result of the Suncoast Connector project. The following Table 14 was derived (using the Florida Department of Revenue's five land categories[98]).

Table 14. Direct and Indirect Acres at Stake, by Selective Counties, and Land-Use

County	Direct land loss acres	(1)			(2)	(3) & (4)			(5)	Total land loss acres
		Sub-total	within buffer	over buffer		Sub-total	within buffer	over buffer		
Dixie	740.1	512.7	293.3	219.4	16.9	49.2	13.4	219.4	161.4	1,357.3
Citrus	570.5	26.8	11.9	14.9	63.5	82.5	10.8	14.9	397.8	1,061.7
Gilchrist	62.2	27.6	-	27.6	2.1	22.2	3.3	27.6	10.4	129.8
Levy	1,435.3	660.1	165.4	494.7	71.8	298.7	44.2	494.7	404.7	2,901.2
Taylor	1,017.7	715.6	200.8	514.8	16.2	63.7	37.7	514.8	222.2	2,285.8
Jefferson	1,433.2	686.4	225.1	461.2	61.2	487.0	128.0	461.2	198.7	2,615.5
Total	5,259.1									10,351.2

[97] $15.3B (= $6.7*2.85%/0.0125); with 2.85%- or 35.1-years' time to capital recuperation, see Table 4 in the report.

[98] Land categories (1) Natural (excl. open water), (3) Pasture and (4) Intensive Agriculture. With (2) Semi-Natural, it is assumed that a split doesn't impact the use, and with (5) Residence, Commerce, and Industrial Development, average parcel sizes were used.

It should be noted that neither Lafayette nor Madison County are listed in the Table, given that for this study, the current US19 trajectory is assumed. The results of the direct losses due to the construction of the Suncoast Connector toll road are provided in Table 15.

Table 15. Losses in Assets, and Revenues, by County and Land-Use (in $2020)

	Loss in Productive Assets				Loss in Revenue # Businesses	
Categories / counties	(1)	(2)	(3-4)	(5)	(3-4)	(5)
Dixie	$9,633,063	$1,595,041	$27,615,302	$8,083,901	$47,527,112	1
Citrus	$3,092,214	$9,640,336	$11,101,846	$153,784,809	$13,055,295	7
Gilchrist	$1,063,339	$155,022	$4,383,462	$1,572,730	$18,226,347	1
Levy	$15,720,828	$5,099,951	$32,095,706	$34,763,183	$116,365,407	3
Taylor	$6,964,979	$1,936,019	$4,486,204	$12,556,821	$7,128,601	1
Jefferson	$13,139,123	$3,263,780	$82,992,606	$30,955,328	$103,906,375	4
Sub-totals	$49,613,546	$21,690,149	$162,675,126	$241,716,772	$306,209,137	17
Total	$475,695,594				$306,209,137	17

In summary, from the Table above, it can be assumed that for the purpose of the Suncoast Connector construction, an estimated $475.7 million is lost in productive assets (sum of the first four columns in Table 15).