NEEDS ASSESSMENT OF FLORIDA PUBLIC LIBRARY E-GOVERNMENT AND EMERGENCY/DISASTER MANAGEMENT BROADBAND-ENABLED SERVICES

September 14, 2009

By

Charles R. McClure, PhD <cmcclure@lis.fsu.edu>
Director, Information Institute and Francis Eppes Professor

Lauren H. Mandel <lmandel@fsu.edu>
Research Coordinator, Information Institute

John T. Snead, PhD <jsnead@fsu.edu>
Manager for Research Development, Information Institute

Bradley Wade Bishop <bwb06c@fsu.edu>
Research Associate, Information Institute

Joe Ryan <jryan@earthlink.net>
Hurricane Project Manager, Information Institute

With the Assistance of:
Dr. Charles C. Hinnant, Carla Wright, and John Brobst

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

Introduction

The Information Use Management and Policy Institute (Information Institute) of Florida State University received a grant from the State Library and Archives of Florida to conduct a needs assessment of Florida's public library E-government and emergency/disaster management broadband-enabled services. This report provides preliminary results from that needs assessment for the State Library and Archives of Florida.

This project provides preliminary findings that will assist the State Library and Archives of Florida in determining:

1. broadband needs of public libraries in Florida; and
2. E-government and emergency/disaster management services that might be deployed throughout the state with increased broadband connectivity.

This is a first step to enhance delivery of broadband-based E-government and emergency/disaster management services and resources, improve Florida residents' access to and use of these services and resources, and assist public libraries to better support these activities at local and state levels. Additionally, the findings provide background information and justification for a proposal to the National Telecommunications and Information Administration Broadband Technology Opportunities Program to support improving Florida public libraries' broadband capacity.

Current Context of Public Library Internet Access

For millions of Americans, public libraries provide their only free access to computers and the Internet, access that is critical to their engagement in the global Information Society. Therefore, Internet connection must be the fastest possible to ensure that all Americans have the opportunity to participate fully in the interactive Web 2.0 environment. Public libraries also provide Internet-enabled services, such as E-government and emergency/disaster management services. These services are affected by the libraries' connection speeds, with libraries able to provide more services as their Internet connectivity speeds increase.

Emergent Issues Related to Public Library Internet Service Provision

U.S. public libraries in general and Florida public libraries in particular provide free access to the Internet and a range of Internet-enabled services in a complex and challenging environment. The environment is complicated by lack of clear definitions for "broadband" and "rural," two key terms with regard to ARRA funding for broadband Internet deployment and adoption. Network configurations, other factors impacting workstation speeds, and situational factors further complicate public library Internet access. These conditions affect each library's ability to provide different levels of broadband-enabled services.

Findings from the Needs Assessment

This study provides only preliminary data of broadband for Florida public library outlets and K-12 public schools. However, it is clear that pockets of the state experience low connectivity speeds and high connection costs. Internet speeds and connections for individual public library and school library outlets are subsequently affected in these areas of Florida. Library outlets all over the state report connection speed insufficiency, and the majority of Florida public libraries report the number of public access workstations also is insufficient to meet patron needs some or all of the time. Situational factors play a critical role in affecting each library's technology access and services. These factors cannot be ignored when considering how best to assist libraries improve network efficiencies and computer equipment.

Current Florida public libraries' Internet connectivity costs and speeds prevent many librarians and libraries from adequately serving their communities. These communities turn to their public library outlets for emergency/disaster management and E-government services, as well as free and publicly available broadband Internet access to participate in today's information society. However, slow Internet connectivity speeds, high Internet connection costs, and situational factors greatly impact libraries' ability to adequately support E-government and emergency/disaster management services.

Conclusion

Overall, the condition of Florida public libraries' access to and use of broadband requires immediate attention. This study has documented the significant need Florida public libraries have for increased broadband (both speeds and bandwidth) and a range of other equipment and services related to the provision of broadband-enabled services from these libraries. A major conclusion from this study is that simply providing these libraries with large upgrades in existing broadband or providing additional broadband connections to the library may not provide significant improvement of Internet connection speeds at the workstation. Many Florida public librarians will need significant technical staff in areas related to network and telecommunications management, workstation and network configuration and deployment, and broadband services planning and deployment to ensure the design and deployment of efficient connections, internal wiring and network configuration, and upgraded workstations and related equipment.

The impact of these findings and conclusions on Florida public librarians and residents is of significant concern. As Florida libraries try to recover from the vote to cut property taxes, the economic impact of the housing collapse, and the existing recession, residents are significantly handicapped by not being able to access and effectively use a range of broadband services and resources at the local public library. In terms of completing online job applications, interacting electronically with local, state, and federal E-government tasks, and collaborating effectively with local and state emergency/disaster management officials, Florida residents are disadvantaged in their access to quality broadband services and resources available through their public libraries.

NEEDS ASSESSMENT OF FLORIDA PUBLIC LIBRARY E-GOVERNMENT AND EMERGENCY/DISASTER MANAGEMENT BROADBAND-ENABLED SERVICES – DRAFT

The Information Use Management and Policy Institute (Information Institute) of Florida State University received a grant from the State Library and Archives of Florida to conduct a needs assessment of Florida's public library E-government and emergency/disaster management broadband-enabled services. This report for the State Library and Archives of Florida provides preliminary results of the needs assessment. The project began April 28, 2009 and ended June 15, 2009.

INTRODUCTION

The extent to which Florida public libraries can adequately provide Internet-based services and resources to their users depends, in part, on the quality and speed of their connection to the Internet. These speeds, if fast enough, are termed as "broadband" and are measured in kilobytes per second (thousands of bytes received from or uploaded to the network per second or kbps), megabytes per second (millions of bytes received from or uploaded to the network or Mbps), or gigabytes per second (billions of bytes received from or uploaded to the network or Gbps). One purpose of this study is to assess the broadband capacity and need of Florida public libraries both in general and in comparison to K-12 public schools. A second purpose of this study is to describe the E-government and emergency/disaster service roles Florida public libraries provide to their local communities and the public library broadband capacity needed to support these roles.

Considerable discussion of the need for public libraries in Florida to better leverage the knowledge and skills of staff in the provision of E-government and emergency/disaster management services and resources has occurred in recent years. (*Cf*. Bertot, Jaeger, & McClure, 2008; Gibson, Bertot, McClure, Mandel, & Snead, 2008; McClure, McGilvray, Barton, & Bertot, 2007). The need for increased and improved public library broadband connectivity to support E-government and emergency/disaster management services and resources has also been discussed (*Cf*. McClure, 2008; McClure & Jaeger, 2009). In addition, there is recognition that underserved and unserved populations may be located in urban areas (Free Press, 2009). Currently, there is no integrated effort to exploit improved broadband availability or to better leverage the delivery of E-government and emergency/disaster management services and resources among Florida public libraries where increased/improved delivery of these broadband-based services and resources will benefit public libraries and Florida residents.

This project provides preliminary findings that will assist the State Library and Archives of Florida in determining (1) the broadband needs of public libraries in Florida and (2) the E-government and emergency/disaster management services that might be deployed throughout the state with increased broadband connectivity. Identifying broadband deployment needs at the state level is a first step to enhance the delivery of broadband-based E-government and emergency/disaster management services and resources, improve Florida residents' access to and use of these services and resources, and assist public libraries to better support these activities at the local and state levels.

Overall, the study finds that the existing broadband connectivity speeds to most public libraries are extremely slow and largely inadequate to support effective E-government and emergency/disaster management services, to say nothing of supporting a range of other networked and electronic services. While the connection speeds to the library "front door" are largely inadequate, the *actual* workstation connection speeds at public library outlets (branch libraries) are oftentimes only moderately better than dial-up connections. The report concludes that a major statewide upgrade of public library broadband is essential if public libraries are to serve effectively in E-government and emergency/disaster management service roles.

Project Goals

The goals of the project are to assist the State Library and Archives of Florida to:

- Describe a number of E-government and emergency/disaster management service roles that the public library could provide its local community;
- Estimate the resource requirements necessary for public libraries to perform the E-government and emergency/disaster management service roles;
- Estimate the level of interest that different types of Florida public libraries would have in offering these various E-government and emergency/disaster management services;
- Identify those Florida public libraries in Local Access and Transport Areas (LATAs),[1] counties, or Rural Areas of Critical Economic Concern (RACECs)[2] that have rural underserved and/or unserved populations, or urban underserved or unserved populations; and
- Improve public library broadband connectivity and E-government and emergency/disaster management services.

Ultimately, this needs assessment is a first step toward improving Florida residents' access to and use of broadband-based E-government and emergency/disaster management services. It is also a step towards assisting public libraries to obtain better broadband connections and better support these activities at the local and state levels. In addition, the needs assessment provides background information and justification to support a proposal to the National Telecommunications and Information Administration (NTIA) Broadband Technology Opportunities Program (BTOP)[3] to support improving the broadband capacity of Florida public libraries.

Project Tasking

The Information Institute addressed a number of tasks during the project. The key tasks include:

[1] LATAs are regions within which telecommunications providers operate, usually former Regional Bell operating companies (RBOCs).
[2] See the section titled *Challenges in Defining "Rural"* (below) for an explanation of the Florida RACECs.
[3] See: http://www.ntia.doc.gov/broadbandgrants/

- Describe the existing broadband connectivity speeds of Florida public library outlets, K-12 schools, and school district offices;
- Describe possible E-government and emergency/disaster management service roles associated with various broadband speeds;
- Estimate the costs associated with upgrading public library equipment in an effort to improve network efficiency and at-the-workstation connection speeds;
- Identify and describe public library broadband and E-government and emergency/disaster management service needs in underserved, unserved, and rural populations; and
- Produce a final report with findings for improved public library broadband connections to support E-government and emergency/disaster management service roles.

Appendix A provides additional details about completing these tasks. Given the short duration of this project, the needs assessment should be considered a preliminary assessment that offers an initial set of findings regarding public library broadband connectivity and E-government and emergency/disaster management service roles.

Project Methodology

The needs assessment employed a multi-method data collection approach. The data-collection approaches used in this study are:

- *Literature review* – Research team members conducted a literature review of public library technology and broadband use and deployment;
- *Interviews* – Research team members conducted interviews with selected public librarians, emergency management officials, and others knowledgeable about the topic to understand the existing broadband connections and configurations in Florida public libraries, define levels of service roles (i.e., basic, moderate, and extensive), to test and validate the service roles and to estimate capacity and willingness to serve in these E-government and emergency/disaster management service roles, and to obtain review and feedback related to the use and usefulness of developed maps that indicate underserved and unserved populations by LATA, county, and RACEC;
- *Public library case studies* – Selected public libraries conducted case studies describing their current broadband configuration/infrastructure and collecting data on their workstation connectivity speeds and network configurations;
- *Public library site visits* – Research team members reviewed and tested public library workstation connectivity speeds and public library network configurations;
- *Geographic Information System (GIS) analysis of public library telecommunications* – Research team members accessed the Bill & Melinda Gates Foundation Florida public library technology dataset (2009), made available by the State Library and Archives of Florida, and the Florida K-12 public school dataset (2009), made available by the Florida Department of Education, to use GIS software to manage, analyze, and display geographically Florida public library broadband information;
- *Public library national survey data analysis* – Research team members analyzed the *Public Library Funding and Technology Access Survey* (American Library

Association and Information Institute, 2009) related to technology and broadband use and deployment; and

- *Connectivity costing models* – Research team members investigated several possible models by which to cost out library equipment and bandwidth upgrades, ultimately settling on a menu of equipment options so libraries could select the equipment and services that best meet their situational technology needs.

Appendix B provides additional information related to the project methods and data collection techniques used in this study.

U.S. PUBLIC LIBRARIES AND INTERNET SERVICE PROVISION: CURRENT CONTEXT

For millions of Americans, public libraries provide their only free access to computers and the Internet. Access to the Internet is critical for Americans to engage in the global information society so Internet connections must be the fastest possible, ensuring that all Americans have the opportunity to participate fully in the interactive Web 2.0 environment. One way to do this is by providing access through public libraries to high-speed broadband, i.e., 100 Mbps.

In addition to providing free public computing and Internet access, public libraries provide Internet-enabled services, such as E-government and emergency/disaster management services, which significantly impact their communities. These services are affected by the libraries' connection speeds, with libraries able to provide more services as their Internet connectivity speeds increase. This section describes the current context in which public libraries access and use the Internet and a number of issues that affect the degree to which public libraries can successfully provide a range of broadband-based services to their users.

Importance of Free Public Internet and Computer Access

Free Internet access at public libraries is especially crucial to those Americans who lack home broadband access and rely on the public library or other public spaces to get high-speed Internet access (Communication Workers of American, ALA, & Speed Matters, n.d.). In April 2008, only 55 percent of American adults had home broadband access, and 10 percent of American adults were continuing to rely on dial-up Internet service (Horrigan, 2008). Rural Americans are least likely to have home broadband access (38 percent), as compared to suburban (60 percent) and urban (57 percent) Americans.

Microsoft Corporation stresses the importance of free public library Internet access, especially for rural and remote communities that lack the population and money to support public Internet access spots (e.g., coffee shops) (Boyd & Berejka, 2009). In these communities where the public library is the only provider of free public Internet and computer access, it is critical that the library's Internet connection be at the fastest possible speed so residents can access the global Information Society, including E-government and emergency/disaster management services.

When public libraries gain access to higher connectivity speeds and greater bandwidth, that access also has been brought into the community where last-mile connections can expand this high-speed Internet into private homes and businesses (Charytan, Zachary, DeVries, Sherwood, Zinman, Phillips, et al., 2009; Gupta, Berejka, Griffin, & Boyd, 2009; Hudson, 2007; Oblinger, Van Houweling, & Semer, 2009; Sheketoff, 2009a). In this situation, libraries may serve as distributed hubs for improved Internet access in their communities. This is why Microsoft Corporation and Google suggest that the National Telecommunications and Information Administration (NTIA) fund future-proof technologies such as fiber to anchor institutions (e.g., public libraries and schools) as a way to improve broadband Internet access in American communities (Boyd & Berejka, 2009; Gupta et al., 2009; Whitt & Lampert, 2009).

Importance of Public Library Internet-Enabled Service Roles

Millions of Americans rely on public libraries for economic, educational, and social opportunities that they would not otherwise have (Golston, 2009; Kranich, 2006). One major component of this is training to use information and information resources. Beyond training, public library Internet-enabled service roles include: providing access to and assistance with E-government services, facilitating disaster management especially in responding to community emergencies, and promoting civic engagement through E-government services (American Library Association, 2008; ALA Office for Research and Statistics, 2009b; Goldman, 2009a; Sheketoff, 2009a).

In addition to training people to use information and resources that are critical to succeeding in the Information Age, public libraries have a major impact through provision of E-government and disaster planning and response services. For people without home Internet access, or with slow home Internet connections, public libraries may be the only way to access E-government services (Bertot, Jaeger, Langa, & McClure, 2006; Goldman, 2009a). Also, public libraries provide Internet access and assistance locating friends and family or help with FEMA and insurance forms in the wake of disasters (Benton, Rintels, & Hudson, 2009; Bertot et al., 2006; Jaeger, Langa, McClure, & Bertot, 2007; Kranich, 2006; McClure, Ryan, Mandel, Brobst, Hinnant, Andrade, et al., 2009).

The public's ability to access these Internet-enabled services often depends on their public library's Internet bandwidth and connection speeds (Communication Workers of America et al., n.d.; Goldman, 2009a). The California Broadband Task Force identifies the applications that varying Internet connections upstream and downstream speed ranges can support (Goldmand, 2009a).

- *500 kbps – 1 Mbps*: voice over IP, SMS, basic email, web browsing simple sites, streaming music using caching, and low quality, and highly compressed video.
- *1 Mbps – 5 Mbps*: web browsing complex sites, email with larger file attachments, remote surveillance, IPTV-SD, small and medium size file sharing, ordinary telecommuting, one channel of digital broadcast video, and streaming music.
- *5 Mbps – 10 Mbps*: advanced telecommuting, large size file sharing, multiple channels of IPTV-SD, switched digital video, video on demand SD, broadcast SD video, two to three channels of video streaming, HD video downloading, low definition telepresence, gaming, basic medical file sharing and remote diagnosis, remote education, and building control and management
- *10 Mbps – 100 Mbps*: telemedicine, educational services, broadcast video SD and some HD, IPTV-HD, complex gaming, telecommuting with high quality video, high quality telepresence, HD surveillance, smart building control
- *100 Mbps – 1 Gbps*: HD telemedicine, multiple educational services, full HD broadcast video, full IPTV channels, video on demand HD, immersion gaming, and telecommuting with remote server services
- *1 Gbps – 10 Gbps*: research applications, uncompressed HD video streaming telepresence, live event digital cinema streaming, telemedicine with remote control of

medical instruments, interactive remote visualization and virtual reality, sharing terabyte size datasets, and remote supercomputing

Public libraries provide important services through Internet-enabled service roles, but such services are hampered by Internet connections that are too slow online and that have insufficient bandwidth. Increasing public library Internet connectivity speeds and bandwidth can enhance the provision of E-government, emergency/disaster management, and other Internet-enabled services.

Context of Public Library Internet Access and Service Provision

As more and more applications require greater quantities of bandwidth, simply providing free public Internet access is not sufficient (National Telecommunications and Information Administration, 2004). It is becoming necessary to consider the speeds of Internet connectivity as this impacts the adequacy of the connectivity to meet the needs of library users and staff (Bertot & McClure, 2007). It has been noted that "As online services and programs become more sophisticated, the need for higher access speeds for all libraries in all communities – large and small – grows" (ALA Office for Research and Statistics, ALA Office for Information Technology and Policy, & Information Use Management & Policy Institute, 2008, p. 7). This is especially critical for users who lack home broadband Internet access and rely on public libraries, but those libraries also may lack broadband and the resources to upgrade their connections (Golston, 2009).

Rural public libraries are more likely than urban and suburban public libraries to offer slower connection speeds, fewer public access workstations, and less wireless access (ALA Office for Research and Statistics et al., 2008). However, this does not mean that connection speeds and Internet access are sufficient in urban and suburban public libraries. These libraries serve greater volumes of patrons and host more wireless access and advanced Internet-based services such as digital reference, licensed databases, audio content, and digitized collections, often on the same Internet connection.

Maximum speeds are achieved when there are few users on the same Internet connection, an infrequent scenario in public libraries where it is usual for multiple users to share a single connection simultaneously. This is why Microsoft corporation says that public libraries require more bandwidth than residential connections. They suggest that basic broadband for anchor institutions should be 100 Mbps symmetrical (upstream *and* downstream), a speed also suggested as minimum for libraries by the Bill and Melinda Gates Foundation but currently available to few public libraries (Boyd & Berejka, 2009; Golston, 2009).

Summary of Current Context

Millions of Americans rely on public libraries and other public institutions to provide high-speed Internet access to engage the global Information Society. These Americans may lack access to home broadband Internet because they live in remote, rural, or unserved locations, or because they cannot afford the higher costs of broadband connections. For these underserved and unserved Americans, free access to the Internet at public libraries is crucial.

However, this access must be at the highest possible speeds and largest bandwidth so public libraries can better provide free public Internet access and associated Internet-enabled service roles, including E-government and emergency/disaster management services. Higher levels of service require public libraries to have access to broadband Internet at a minimum of 100 Mbps symmetrical, a goal supported by the American Library Association, Microsoft Corporation, and the Bill and Melinda Gates Foundation. A first step toward this goal would be to spend American Recovery and Reinvestment Act (ARRA)[4] funds to lay fiber to public library facilities. Fiber lines would increase the connection speeds available to public libraries, thereby increasing the speeds available to the libraries' users – the American public.

[4] See: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h1enr.pdf

EMERGENT ISSUES RELATED TO U.S. PUBLIC LIBRARY BROADBAND INTERNET ACCESS

The literature demonstrates the importance of public library Internet access and Internet-enabled services, but library Internet access and service provision is hampered by several issues. Public library Internet access is provided in a context of unclear definitions for "broadband" and "rural" and complicated network configurations and situational factors impacting Internet access and service provision. These issues are discussed in more detail in this section. National key issues are discussed first followed by issues specific to Florida public libraries.

Discussion of Key Issues

Public library Internet service provision is important but it occurs in a complicated and challenging environment. ARRA includes funding for broadband build-out to public libraries (especially in rural areas), but the Act lacks definitions for "broadband" and "rural." Additionally problematic is the difficulty in understanding complicated network structures that impact at-the-workstation connectivity speeds and the situational factors that impact public libraries' ability to upgrade their Internet bandwidth and sustain this access. All of these issues impact libraries at both the national and state levels.

Challenges in Defining "Broadband" for Public Libraries

In the ALA's comments to NTIA, Sheketoff asserts that being in an area that doesn't qualify as unserved/underserved based on residential broadband availability should not disqualify a library (2009b). A major issue here is how to define broadband, and whether broadband means the same thing for libraries as it does for residential consumers. Sheketoff explains further that unserved and underserved have different meanings for libraries than residential users.

The Free Press suggests broadband should be defined at a required minimum of 4 Mbps constant upload speed (Turner, 2009). This is based on the definition of advanced telecommunications capability in the Telecommunications Act of 1996: "high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video" (110 Stat. 56 § 706). In determining that 4 Mbps constant upstream speed should be the minimum for broadband, the Free Press calculated the necessary minimum Internet connection speed to meet the capability defined in the Telecommunications Act. However, the Free Press stresses that this is the minimum speed necessary to meet 2008 requirements and higher speeds may be needed to fulfill the capability in 2018.

Many of the comments to NTIA and the Federal Communications Commission (FCC) include recommendations for defining broadband, such as the following:

- Microsoft (Boyd & Berejka, 2009; Gupta et al., 2009): for ***homes***, basic broadband is 4 Mbps upstream and downstream and for ***anchor institutions*** (e.g., public libraries), basic broadband is 100 Mbps upstream and downstream;

- AT&T (Byrd, Charytan, & Zachary, 2009): Greater than or equal to 786 kbps downstream and greater than 200 kbps upstream;
- Communication Workers of America (Goldman, 2009a, 2009b): 3 Mbps downstream and 1 Mbps upstream;
- EDUCAUSE (Luker, 2009): Set a goal of increasing speeds to where 100 Mbps becomes the new minimum for definition of broadband; and
- Comcast (Zachem, Don, McManus, & Waz, 2009): use a five-tier system of defining broadband levels with Basic (256 kpbs downstream and upstream), Current Generation (600 kbps downstream and 500 kbps upstream), Next Generation (12 Mbps downstream and 2 Mbps upstream), Next Generation Advanced (50 Mbps downstream and 10 Mbps upstream), and Next Generation Commercial (100 Mbps symmetrical) with goals for anchor institutions of Next Generation Advanced by 2012 and Next Generation Commercial by 2015.

In general, definitions of broadband are problematic for libraries since the definitions are based on home Internet connections with one or two computers accessing the Internet at a time. This is not the case in public libraries, where dozens of patrons and library staff are accessing the Internet at the same time, and often on a shared network with the library's wireless Internet (ALA Office for Research and Statistics et al., 2008). A few comments to NTIA and FCC suggest adoption of different definitions/standards of broadband for anchor institutions such as libraries because of their need to support multiple simultaneous users and applications that require greater quantities of bandwidth (*Cf*. Boyd & Berejka, 2009; Gupta et al., 2009; Zachem et al., 2009).

EDUCAUSE cites consumers' need for simultaneous multiplicity of Internet services as a factor making more broadband a necessity (Windhausen, 2008). This is even more critical in libraries, where it is not one consumer requiring simultaneous multiplicity of Internet services, but multiple consumers requiring this kind of access concurrently, all on the same Internet connection (Kranich, 2006). Microsoft advocates that basic broadband for public libraries, schools, and hospitals is 100 Mbps symmetrical, a definition that considers the multiplicity of simultaneous users in these anchor institutions and differs from Microsoft's proposed definition of basic broadband for residential communities of 4 Mbps symmetrical (Boyd & Berejka, 2009).

Challenges in Defining "Rural"

There are several authorities who define the term rural, and numerous possible definitions. This multiplicity is confusing and renders the term rural problematic as a designation for populations or communities since it is virtually impossible to compare data about "rural" populations or areas from one source to the next. Nationally, the most frequently cited definitions come from the U.S. Census Bureau (Census Bureau) and U.S. Department of Agriculture (USDA).

The Census Bureau defines rural in contrast to urban, meaning all U.S. territory, population and housing not considered urban is automatically defined as rural (n.d.). Urban territory, population and housing are those in urbanized areas which include a central place and adjacent territory with 1,000 persons per square mile totaling at least 50,000 persons, or places

with populations over 2,500. Adding to the confusion, the Census Bureau says that rural and urban classifications cross other hierarchies and are irrespective of metropolitan or non-metropolitan status.

The USDA Economic Research Service notes it has developed multiple classifications for defining rural (2007). In fact, USDA data may be classified according to any of nine definitions of rural. Three are based on Census places and three on Census Urban Areas, denoting the confusion caused by the singular Census Bureau definition. The remaining three USDA definitions of rural are based on Office of Management and Budget Metropolitan Statistical Area (MSA) designation, making rural all counties outside defined metropolitan areas in 2003; USDA Rural-Urban Commuting Area Codes, making rural Census tracts with codes 4 through 10; and USDA Business and Industry loan program definition, making rural all locations outside places with 50,000 or more persons and associated urbanized areas. These nine definitions of rural are so variant that they may include anywhere from 48.8 million Americans (17 percent of the total U.S. population occupying 75 percent of the total U.S. land area) to 177 million Americans (63 percent of the total U.S. population occupying 99 percent of the total U.S. land area.

Complexity of Factors Affecting Workstation Speeds

There are a host of factors influencing the actual speed at a public or staff Internet workstation (Bertot & McClure, 2007; Charytan et al., 2009; Zachem et al., 2009). First, there are factors related to the type and number of connection(s) and *actual* (not what is advertised) bandwidth the ISP provides to the library (Whitt & Lampert, 2009). Further, some libraries first get their connection through local government offices such as the city or county and have little direct control over the nature of the connection they receive nor the switches or other telecommunications equipment that the city or county uses and through which the bandwidth eventually comes to the library.

In addition, the configuration of the library's network, the effectiveness of library network switches and routers, and cabling, and other factors affect workstation speeds. Switching technologies, latency effects, local settings and parameters, and the ultimate connectivity path from the door to a workstation also affect speed (Bertot & McClure, 2007; Charytan et al., 2009). The possible public library telecommunications network configurations are endless and depending on that configuration and the efficiency of transmissions through those networks, workstation speeds can be significantly affected. Figure 1 depicts a "basic" versus "complex" library network as one example.

Other factors stem from the simultaneous use of multiple Internet services, age and number of workstations, and users on a shared connection (Zachem et al., 2009). For example, if the library has wireless Internet routers on the same connection as wired Internet, connection speeds will be slowed on all workstations. Other factors that affect workstation speeds are the number of workstations connected on the overall library network and number of individual library networks that feed off the bandwidth coming in the front door.

The type and content/applications of the library's integrated library system, if running off the same network for the workstations, affects workstation speeds. Also, the more users ruth simultaneously running applications such as interactive videos and some gaming programs, the slower each connection is. These only begin to describe some of the factors that affect actual workstation speed. A key issue, however, is to recognize that the bandwidth coming in the front door of the public library is NOT the bandwidth available at the workstation.

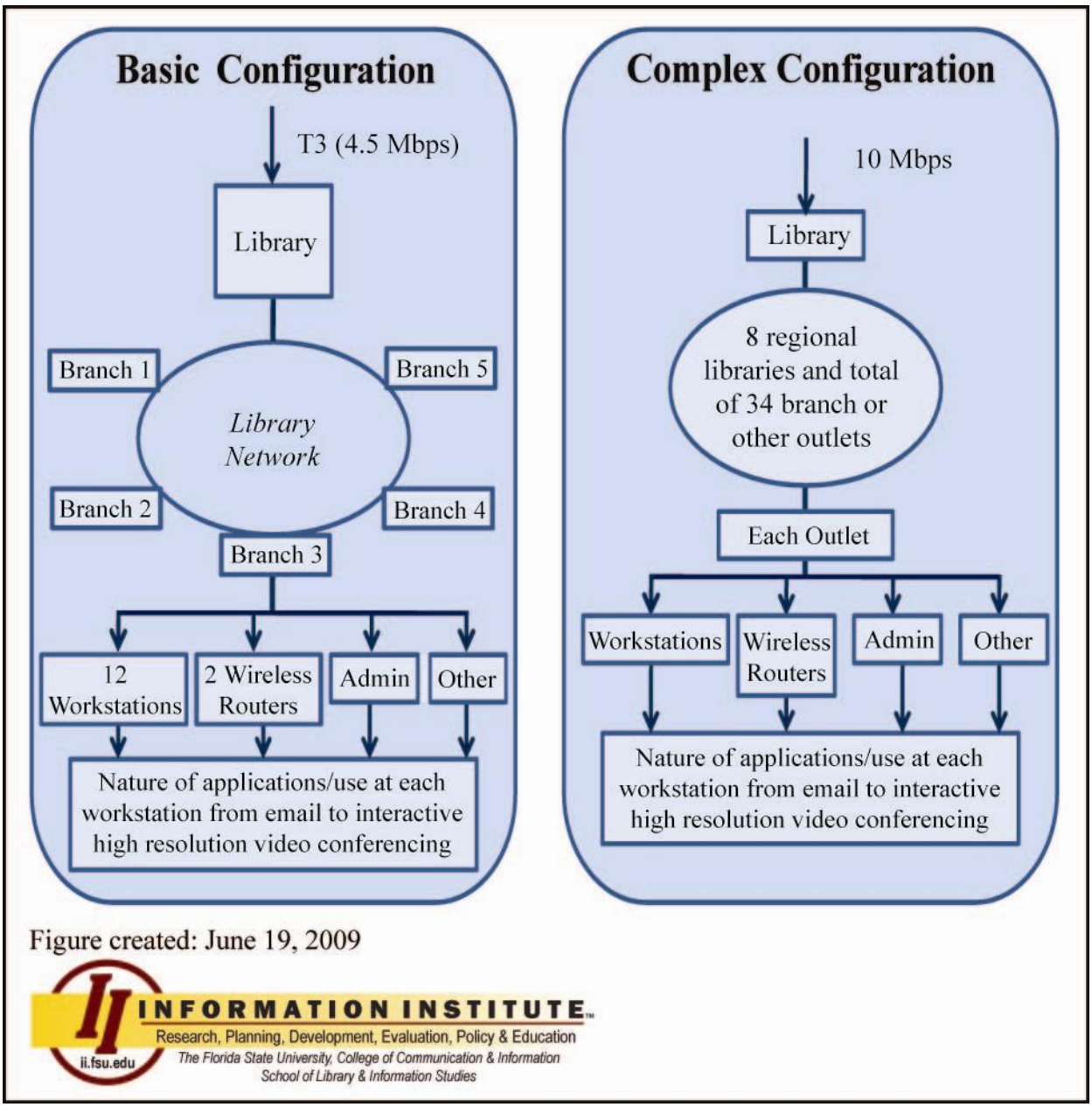

Figure 1. Example of Library Network Configurations

Situational Factors Affecting U.S. Public Library High-Speed Broadband Adoption

ALA, Microsoft, and Google support fiber to the library as a mechanism for improving the quality of Internet access in U.S. libraries while keeping costs sustainable in the future. Yet, only 12.3 percent of libraries reported fiber Internet access in 2008 (Bertot, McClure, Wright, Jensen, & Thomas, 2008). Fiber Internet access is most prevalent in urban public libraries (24.6 percent), but there is a need for additional fiber Internet access in U.S. communities, regardless of metropolitan status. Meanwhile, libraries are often relegated to DSL or cable Internet, if that is all that is available in their communities.

In fact, 26 percent of public libraries reported lack of access to adequate telecommunications services as a factor affecting their ability to provide public access Internet connections (ALA and Information Institute, 2009). This factor is most likely to be reported by rural (30.9 percent) and low poverty public libraries (27.3), but is also highly reported by suburban (26.0 percent) public libraries. Cost-related factors are large inhibitors to libraries' ability to provide public access Internet connection, with 22.9 percent of libraries reporting interest in increasing the library's bandwidth but the library cannot afford to do so.

Lack of access to adequate telecommunications services is a barrier that can be mitigated by spending ARRA funds to lay fiber to the library. Fiber lines would increase the connection speeds available to U.S. public libraries, thereby increasing the speeds available to the libraries' users – the American public. The Bill and Melinda Gates Foundation suggests that NTIA strive to connect all U.S. public libraries at 100 Mbps since these institutions are ubiquitous, used by targeted beneficiaries, and able to promote broadband adoption to help people improve their lives (Golston, 2009).

The Institute of Museum and Library Services notes that "…public libraries are well positioned to play a greater role in providing access points to broadband services for people in both urban and rural areas and to families in need" (Pastore & Henderson, 2009, p. 2). Therefore, budget and policy decisions about broadband deployment should consider the role of public libraries in addressing state and local broadband priorities. For libraries, this means continuing support of the Universal Service Fund and the E-rate program, with modifications to support broadband goals. This is suggested by several comments to the FCC (*Cf*. Benton et al., 2009; Charytan et al., 2009; Education and Libraries Networks Coalition, 2009; Goldman, 2009a; Zacham et al., 2009).

U.S. public libraries and K-12 schools may apply for E-rate discounts under the Universal Service Fund, Schools and Libraries Program, established by the Telecommunications Act of 1996.[5] These discounts may be applied to selected telecommunications, Internet access, and internal connectivity (McClure & Jaeger, 2009). This funding is critical for public libraries' ability to sustain provision of free public access Internet to U.S. communities.

Given the existing reliance of public libraries on E-rate funds for Internet connectivity and access provision, it is crucial that libraries remain eligible for E-rate dollars to sustain any

[5] See: http://www.usac.org/about/universal-service/

bandwidth obtained from ARRA funding. Libraries that receive ARRA funding to increase the bandwidth to the library and resulting Internet connections to the public will not be able to sustain this increased Internet access without future E-rate funding. They will need E-rate money to continue subscribing to their ISPs, at what will likely be a higher rate than they currently pay since ISP rates increase as bandwidth increases. Acceptance of ARRA funding must not make libraries ineligible for E-rate funding; public libraries require both ARRA money to increase bandwidth and E-rate money to sustain free public Internet access throughout the U.S.

Specific Issues Related to Florida Public Library Broadband Internet Access

Florida public libraries provide Internet access and services within the larger national context described above, and within a unique context specific to Florida. The Florida Office of Economic Recovery understands that Florida has unique needs. They suggest a more flexible and user needs based approach to defining broadband Internet, saying that, "Florida further recommends that threshold speeds should be dictated by the needs of the end use and end user rather than being prohibitively prescriptive in regulation" (2009, p. 4). For that reason, this section discusses the ways the state defines "rural" and the unique situations in which Florida public libraries provide free public Internet access.

Defining "Rural" for Florida Public Libraries

Although Census Bureau and USDA definitions apply to Florida, the State has two definitions of rural embedded in the *Florida Statutes* for specific purposes. One definition comes under the Rural Economic Development Initiative and was used by Enterprise Florida to identify RACECs, and the other is used by the Department of Health to identify Rural Health Networks. See Figure 2 in Appendix C for a comparison of Florida-based definitions for "rural" and Florida counties identified as rural based on the definitions.

The Florida Rural Economic Development Initiative defines a rural community in four ways, two of which pertain to counties and two of which pertain to municipalities (Figure 2 in Appendix C) (19 *Florida Statutes* § 288.0656 (2) (a)). These definitions statutorily are based on official population estimates from the Office of Economic and Demographic Research. For counties, a rural community is a county with a population less than or equal to 75,000 persons (identifying 30 Florida counties as rural), or a county with a population less than or equal to 100,000 persons that is geographically adjacent (i.e., contiguous) to a county with a population less than or equal to 75,000 persons (identifying one additional Florida county as rural) (Florida Office of Economic and Demographic Research, 2009). Municipalities are rural if they fall in rural counties as defined previously, or an unincorporated federal enterprise community or incorporated rural city with a population less than or equal to 25,000 persons and an employment base focused on traditional agricultural or resource-based industries geographically located within a county not designated as rural but with three or more economic distress factors (19 *Florida Statutes* § 288.0656 (2) (a)).

Enterprise Florida used the Rural Economic Development Initiative definitions to identify three Rural Areas of Critical Economic Concern (RACECs). (A map of the RACECs is

available in Figure 3 in Appendix C). A RACEC is a region "comprised of rural communities that have been adversely affected by extraordinary economic events or natural disasters" (Enterprise Florida, 2009). The three RACECs are Northwest, North Central, and South Central, and they include 28 counties in total. Enterprise Florida identifies four additional rural counties that fall outside the RACECs.

Florida Rural Health Networks are based on defining a rural area as any area with fewer than 100 persons per square mile or any area the most recent U.S. Census has defined as rural (Figure 1 in Appendix C) (29 *Florida Statutes* § 381.0406 (2) (a)). This definition identified 33 counties as rural in 2005.

Situational Factors Affecting Florida Public Library Broadband Internet Access and Service Provision

In Florida, 55.6 percent of public library outlets report they are the only provider of free public Internet access (ALA and Information Institute, 2009). This is critical in a state where only one-third of its 18 million residents (6.3 million) have home broadband access (Florida Office of Economic Recovery, 2009). For the others, the public library may be the only free access point for computing and the Internet.

However, Florida public libraries report greater workstation and Internet connection insufficiency than national averages. Where 18.9 percent of all U.S. public libraries report all-times workstation sufficiency, only 12.5 percent of Florida public libraries report workstations are sufficient to meet patron needs at all times (ALA and Information Institute, 2009). Also, only 25.9 percent of Florida public libraries report their connection speed is always sufficient, more than ten percent lower than the national average (39.9 percent of all U.S. libraries report all-times sufficient connection speed), and whereas nationally 17.7 percent of libraries report their connection speed is always insufficient, 20.4 percent of Florida libraries report their connection speed is always insufficient. This greater insufficiency is in spite of the fact that Florida public libraries report more workstations and higher connection speeds than national averages, suggesting that comparing Florida to national averages requires consideration of the larger number of workstations and higher bandwidth necessary to serve the large Florida population.

Part of this insufficiency may be the result of shared connection between wired and wireless Internet. Nearly 70 percent (69.2 percent) of Florida libraries report that wired and wireless Internet share the same bandwidth/connection (ALA and Information Institute, 2009). Only 33.2 percent use some kind of management techniques to mitigate the shared connection. For the other 36.0 percent, wired and wireless Internet are sharing the same connection without the benefit of any management techniques.

Within this context of insufficient workstations and Internet connection speeds, Florida public libraries provide free public Internet access and a range of Internet services that would be benefited by enhanced access to broadband Internet. For example, 85.1 percent of Florida libraries provide access to government information and services, 61.9 percent provide services for job seekers, and 61.2 percent provide education resources and databases for K-12 students,

among other services (ALA and Information Institute, 2009). All of these services could be enhanced by statewide public library broadband Internet connectivity.

Currently, 29.1 percent of Florida public libraries report connection speeds greater than 10 Mbps and 44.1 percent report they connect via fiber (ALA and Information Institute, 2009). Although both of these figures are higher than the national averages (12.3 percent of U.S. libraries at speeds greater than 10 Mbps and 17.5 percent connected via fiber), they are short of the goal of all Florida public libraries being connected to high-speed Internet via fiber so they can provide a wide range of broadband-enabled services, such as extensive E-government and disaster management service roles (see the section titled E-Government and Emergency/Disaster Management Service Roles below for more detail on the extensive level of service).

Meanwhile, Florida public libraries suffered reduced funding in the wake of property tax cuts passed in January 2008. To offset budget cuts, libraries have reduced hours, closed branches, and cut staff, with more cuts looming for the 2009-2010 fiscal year in Broward and Suwannee Counties, among others (*Cf*. Livingston, 2009; Wyman, 2009). Despite these funding and staff cuts, Florida public libraries continue to provide free public Internet access and Internet-enabled services. Many of these libraries rely on E-Rate discounts to fund public and staff Internet access. These libraries cannot afford to increase bandwidth or public access to broadband Internet without funding from ARRA or other sources, as well as sustained E-Rate discounts to support continued subscription to broadband Internet.

Summary of Emergent Issues

Nationally and in Florida specifically, public libraries provide free access to the Internet and a range of Internet-enabled services in a complex and challenging environment. The environment is complicated by lack of clear definitions for "broadband" and "rural," two key terms with regard to ARRA funding for broadband Internet deployment and adoption. Further complicating public library Internet access are network configurations and other factors impacting workstation speeds and situational factors affecting each library's ability to provide different levels of broadband-enabled services.

The situation in Florida is somewhat different than national averages, with greater insufficiency of workstations and connection speeds despite larger average numbers of workstations and faster average connection speeds. This seeming contradiction may be the result of Florida's large population, or other factors unique to Florida including reduced public library budgets. The following section details findings from the needs assessment of Florida public libraries broadband connectivity and further explains the situation in which public libraries provide Internet access and Internet-enabled services in Florida.

FLORIDA PUBLIC LIBRARY BROADBAND CONNECTIVITY NEEDS ASSESSMENT FINDINGS

The needs assessment used a number of data collection techniques that resulted in multiple findings. The findings present a preliminary picture of Florida public library broadband connectivity and the extent to which Florida public libraries have adequate broadband to provide E-government, emergency/disaster management services, and a range of other electronic or networked services.

Current State of Broadband Access in Florida Public Libraries: PLFTAS and ALA Survey Data

Analysis of the *Public Library Funding and Technology Access Survey* (*PLFTAS*) data indicates three issues that are critical to the provision of public Internet access and E-government and emergency/disaster management services in Florida public libraries.

- *Connectivity Issues*: Internet connection speeds vary among Florida libraries, and over three-quarters of public libraries (urban, suburban, and rural) report connection speeds are insufficient all or some of the time with cost and availability reported as the two major factors impacting libraries' ability to increase connection speeds.
- *Internet Services*: Broadband speeds impact public libraries' provision of E-government, job-related, and education information, formal and informal information technology training and E-government services, and wireless Internet access.
- *Workstation Issues*: Along with insufficient connection speeds, urban, suburban, and rural Florida public libraries report insufficient numbers of workstations all or some of the time, regardless of variations in number and age of workstations across MSA type, and this insufficiency results in the majority of libraries limiting the number and length of patron Internet sessions each day.

Each of these issues is discussed in more detail below, with accompanying figures illustrating key points. All analysis and discussion is based on survey data gathered from Florida public libraries as part of the *PLFTAS*. Other relevant figures are located in Appendix D.

Connectivity Issues

Internet connection speeds vary among Florida libraries, but most libraries report speeds at or above T1 (1.5 Mbps) (Figure 4 in Appendix D). However, over three-quarters of public libraries (urban, suburban, and rural) report connection speeds are insufficient all or some of the time (Figure 5 below). Cost and availability are the two major factors impacting libraries' ability to increase connection speeds (Figure 6).

The majority of Florida public libraries report maximum connection speeds at or above T1 (Figure 4 in Appendix D). However, suburban and urban public libraries report faster maximum connection speeds than rural public libraries (e.g., 44.5 percent of urban and 20.0 percent of suburban public libraries report maximum speeds in the 6.1 to 10.0 Mbps range but 0 percent of rural public libraries report maximum connectivity in this range). A similar trend is

noticeable at the greater than 10 Mbps range, where 35.6 percent of urban and 33.2 percent of suburban public libraries but only 12.8 percent of rural public libraries report maximum connection speeds in this range.

Regardless of MSA, the majority of Florida public libraries report connection speed insufficiency some or all of the time (Figure 5 below). Well over half of Florida public libraries report connection speed insufficiency at some times, and this is more pronounced in rural and suburban public libraries (62.2 percent of rural and 64.3 percent of suburban, compared to 58.9 percent of urban). About a quarter of Florida public libraries report all-times connection speed insufficiency (25.3 percent of rural, 26.2 percent of suburban, and 22.5 percent of urban public libraries).

Florida public libraries report multiple barriers to increasing connection speeds at varying rates among MSA types (Figure 6 below). While nearly half of urban public libraries (44.5 percent) report the library is at the maximum connection speed available, less than a quarter of suburban (22.2 percent) and rural (12.8 percent) report this is the case. However, suburban (24.4 percent) and rural (23.4 percent) public libraries report cost is an impediment to increasing connection speed at higher percentages than urban (4.2 percent) public libraries.

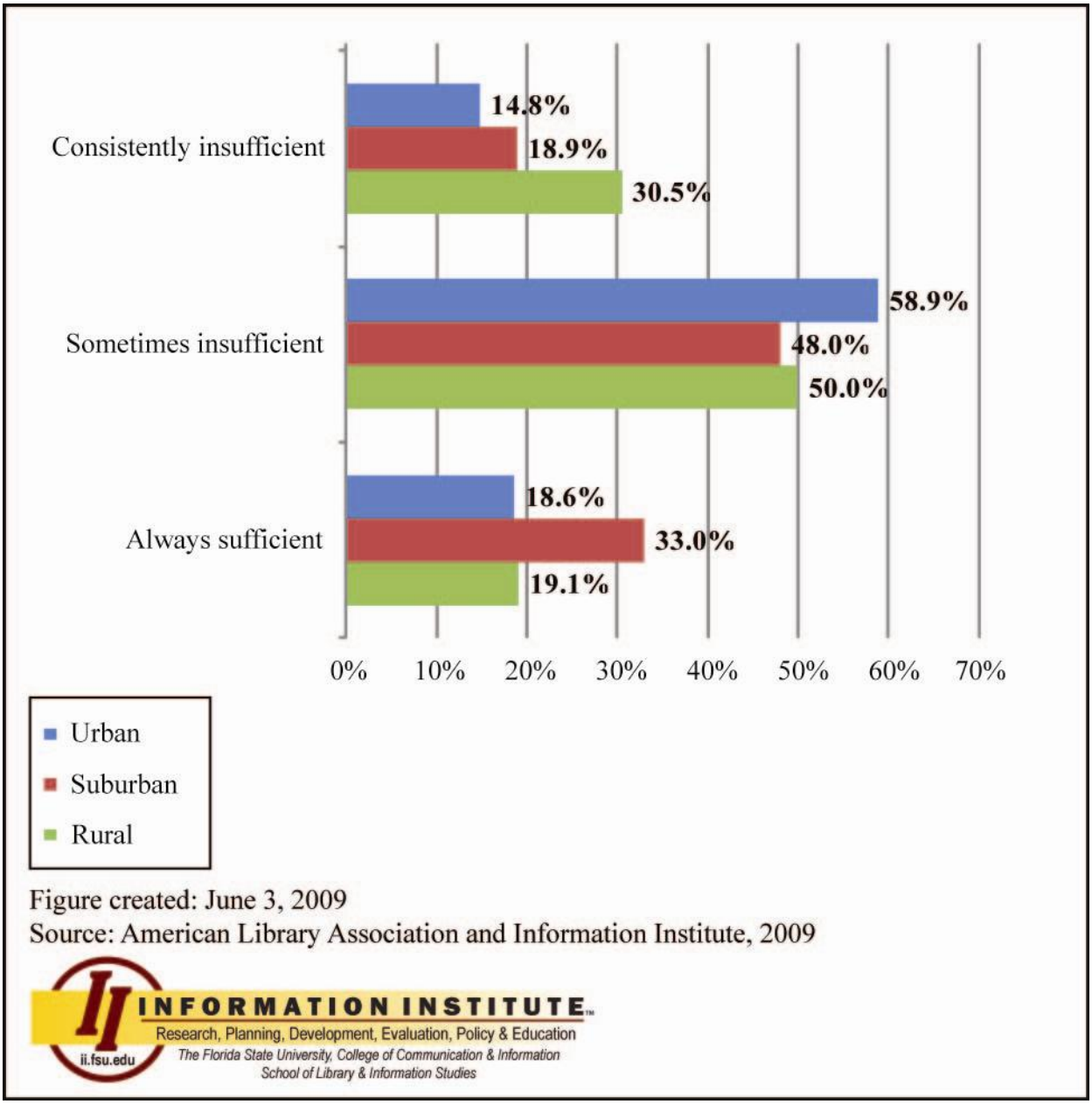

Figure 5. Sufficiency of Connection Speeds in Relation to Capacity by MSA: Florida 2009

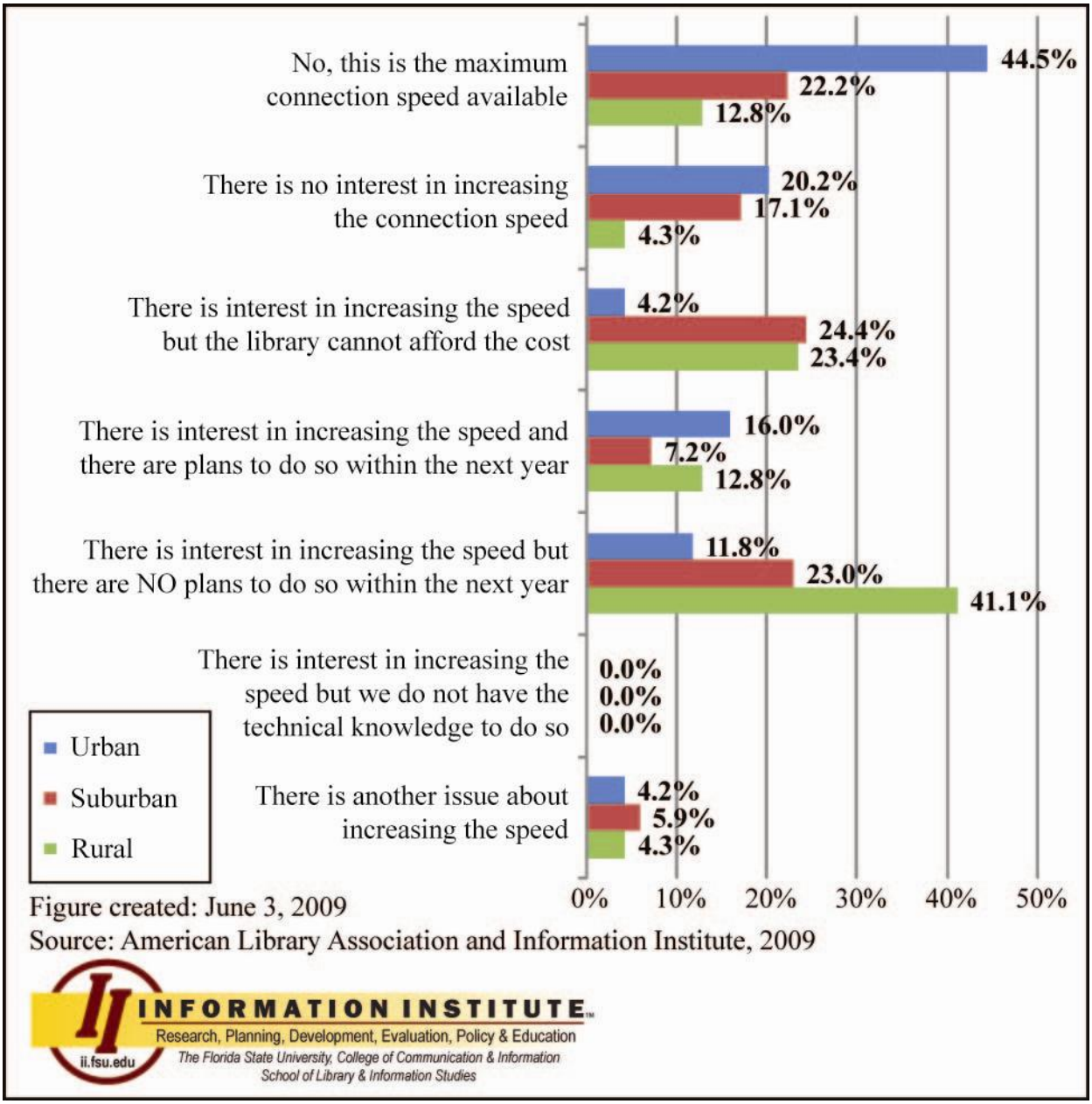

Figure 6. The Possibility of Increasing Internet Connection Speeds for Public Libraries: Florida 2009

Internet Services

Provision of E-government, job-related, and education information are critical public library services impacted by broadband speeds (Figure 7 below). Most Florida public libraries offer formal and informal information technology training (Figure 8 in Appendix D), and for those that offer formal training, general computer skills, Internet use, and computer software are the most frequently reported topics (Figure 9 in Appendix D). As with information technology training, Florida public libraries provide E-government services both informally and formally

(Figure 10). Free wireless Internet is available in the majority of Florida public libraries, although rural public libraries report this at a lower percentage than urban and suburban public libraries (Figure 11 in Appendix D).

Florida public libraries most frequently report access provision to government information (85.1 percent of all libraries), information provision for job seekers (61.9 percent), and provision of education resources and databases for K-12 students (61.2 percent) as the Internet services they provide that are critical to the public libraries' role (Figure 7). Other Internet services reported as critical to the libraries' role include provision of education resources for adult education (50.4 percent of all libraries), provision of education resources for home schooling (32.8 percent), provision of information for economic development (31.8 percent), and provision of computer and Internet training (31.3 percent).

Florida public libraries offer formal and informal information technology training (Figure 8 in Appendix D). About half of public libraries offer formal training, across MSAs (48.1 percent of urban, 58.5 percent of suburban, and 44.0 percent of rural public libraries). Slightly fewer public libraries report providing informal point-of-use information technology assistance (36.4 percent of urban, 44.1 percent of suburban, and 41.4 percent of rural public libraries), and very few Florida public libraries limit technology training to provision of online materials only (0 percent of urban, 2.2 percent of suburban, and 4.8 percent of rural public libraries).

Of the libraries that offer formal technology-based training classes, the most popular topics are general computer skills (97.6 percent of all Florida public libraries), general Internet use (96.2 percent), general computer software (88.5 percent), and general online/Web searching (88.3 percent) (Figure 9 in Appendix D). Other popular topics include using the libraries Online Public Access Catalog (65.4 percent), using online databases (52.6 percent), digital photography, software, and online applications (43.1 percent), and Web 2.0 such as blogging and RSS feeds (31.6 percent).

The vast majority of Florida public libraries report providing as-needed assistance to patrons for understanding how to access and use E-government (100 percent of urban, 90.3 percent of suburban, and 95.2 percent of rural public libraries) (Figure 10). Also, across MSAs, nearly half of all public libraries provide patrons assistance applying for or accessing E-government services (50.0 percent of urban, 55.1 percent of suburban, and 45.9 percent of rural public libraries) and providing immigrants with assistance in using E-government immigration services (50.0 percent of urban, 43.2 percent of suburban, and 51.2 percent of rural public libraries).

Across MSA, the majority of Florida public libraries offer wireless Internet access, but rural public libraries report this at a lower percentage than urban and suburban public libraries (Figure 11 in Appendix D). Whereas, 84.5 percent of urban and 88.8 percent of suburban public libraries have wireless Internet available in public library outlets, only 54.3 percent of rural public libraries report wireless Internet availability. However, 28.4 percent of rural public libraries do plan to make wireless Internet available within the coming year, which would bring wireless Internet access in rural public libraries on a par with wireless Internet access in urban and suburban public libraries.

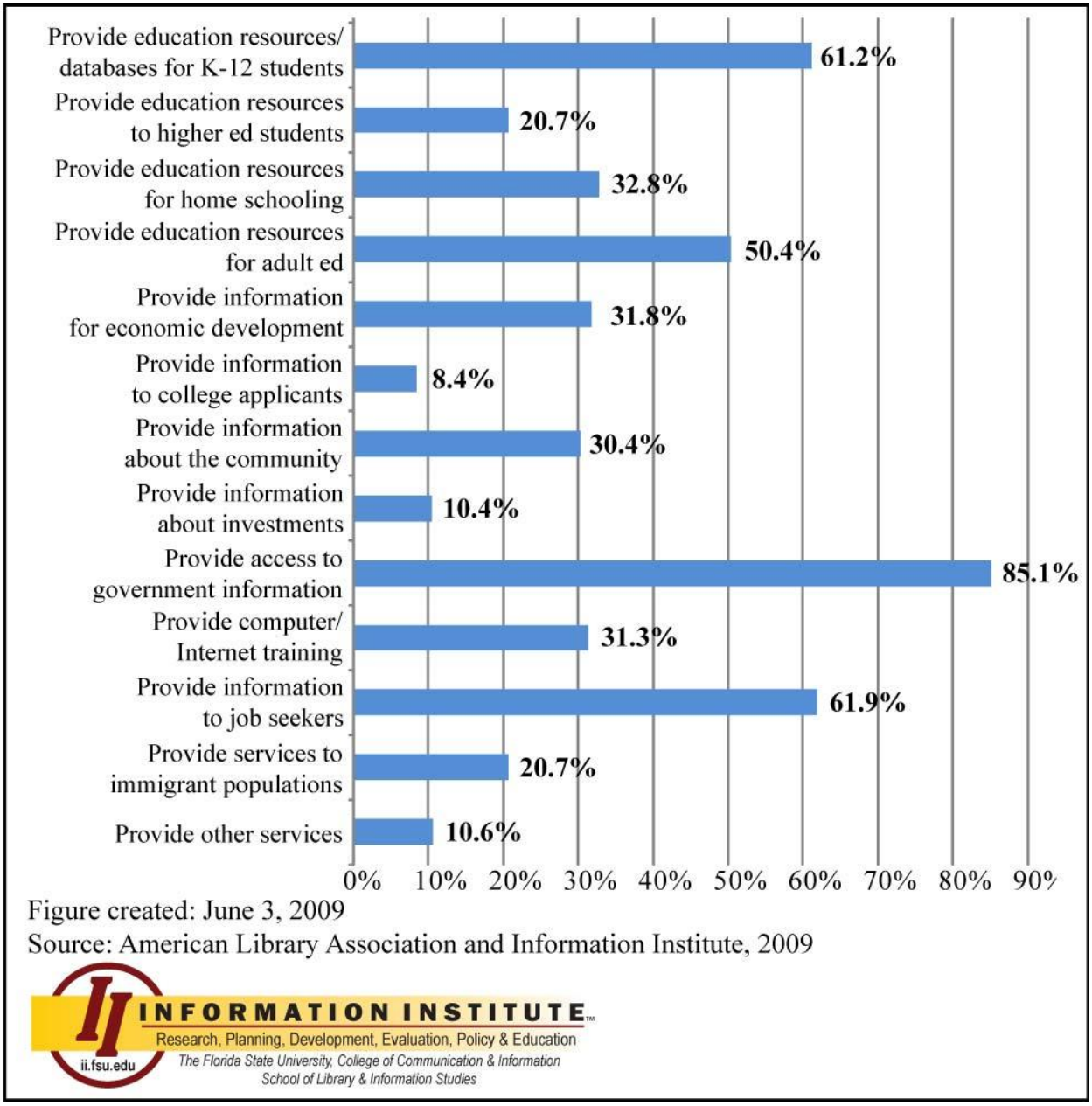

Figure 7. Public Access Internet Services Critical to the Role of the Public Library: Florida 2009

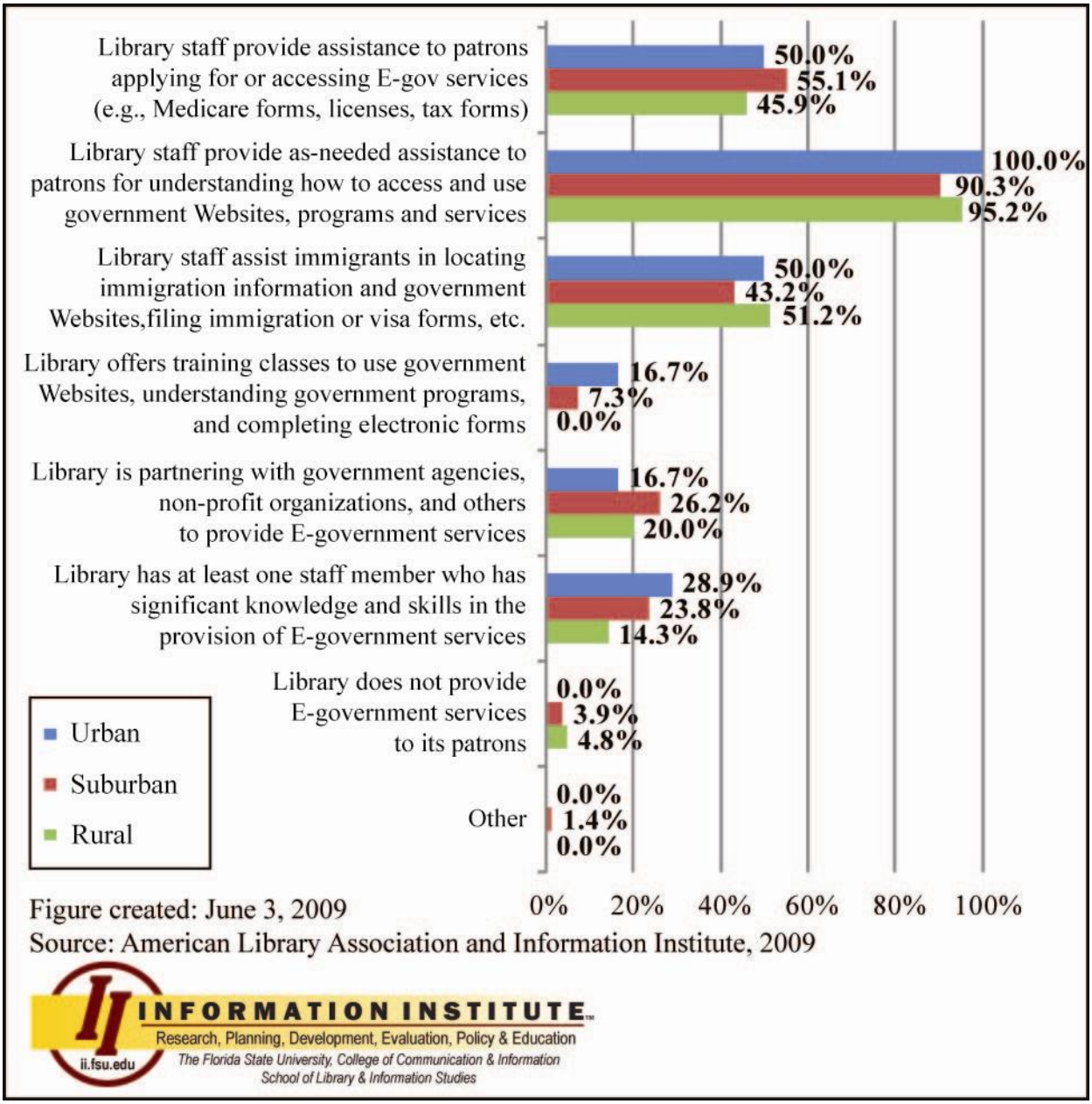

Figure 10. E-Government Roles and Services Provided by Public Libraries by MSA: Florida 2009

Workstation Issues

Florida public libraries report insufficient numbers of workstations all or some of the time, across MSAs (Figure 12 in Appendix D). This is the case for all MSA types regardless of the variation in average numbers of public access workstations, with urban and suburban public libraries reporting more than double the average number of workstations than rural public libraries (Figure 13 below). In addition to reporting fewer workstations, rural public libraries also report longer down times for service of computers than urban and suburban public libraries

(Figure 14 in Appendix D). Workstation insufficiency is one reason behind the limited number of Internet sessions libraries allow patrons each day (Figures 15 and 16 in Appendix D), although rural public libraries are more likely than urban and suburban public libraries to allow patrons unlimited sessions as long as no one is waiting (Figure 17 in Appendix D).

In addition to reporting connection speed insufficiency, the majority of Florida public libraries report that the number of public access workstations is insufficient to meet patron needs some (62.5 percent) or all (25.0 percent) of the time (Figure 12 in Appendix D). Only 12.5 percent of libraries report the number of public access workstations is sufficient to meet patron demands all of the time.

On average, urban public libraries report having more public Internet workstations or laptops (20.8 on average) than suburban (18.6) or rural (9.1) public libraries (Figure 13). Urban public libraries also report more 4 or 5 year old Internet workstations or laptops on average (40.1) than suburban (22) and rural (5.6) public libraries.

There is a wide variety in length of down times for service of computers across MSA types in Florida public libraries (Figure 14 in Appendix D). A larger percentage of rural (41.1 percent) than urban (15.5 percent) or suburban (10.0 percent) public libraries report down times in excess of two days, but urban and suburban public libraries report down times of two days in relatively large percentages (40.3 percent for urban and 33.0 percent for suburban).

Over 90 percent of libraries in all three MSA types report having time limits for patron use of public Internet workstations (100 percent of urban, 96.5 percent of suburban, and 91.8 percent of rural public libraries) (Figure 15 in Appendix D). Rural (4 percent) public libraries report not having time limits at a higher percentage than urban (0 percent) and suburban (2.2 percent) public libraries.

For libraries that report time limits for patron use of public Internet workstations, the majority of urban public libraries report 30 minute per session limits (62.8 percent), but the majority of suburban and rural public libraries report time limits in the 31 to 60 minute range (57.2 percent of suburban and 61.5 percent of rural) (Figure 16 in Appendix D). Very few libraries report time limits greater than one hour (3.9 percent of urban, 3.6 percent of suburban, and 0 percent of rural public libraries), and relatively few report unlimited usage as long as no one is waiting (0 percent of urban, 9 percent of suburban, and 15.6 percent of rural public libraries).

Larger percentages of urban (30.2 percent) and suburban (30.2 percent) Florida public libraries limit patrons to two Internet sessions per day as compared to rural (27.5 percent) public libraries (Figure 17 in Appendix D). In contrast, a larger percentage of rural (31.3 percent) public libraries allow unlimited session,s as long as no one is waiting, compared to urban (25.6 percent) and suburban (17.6 percent) public libraries.

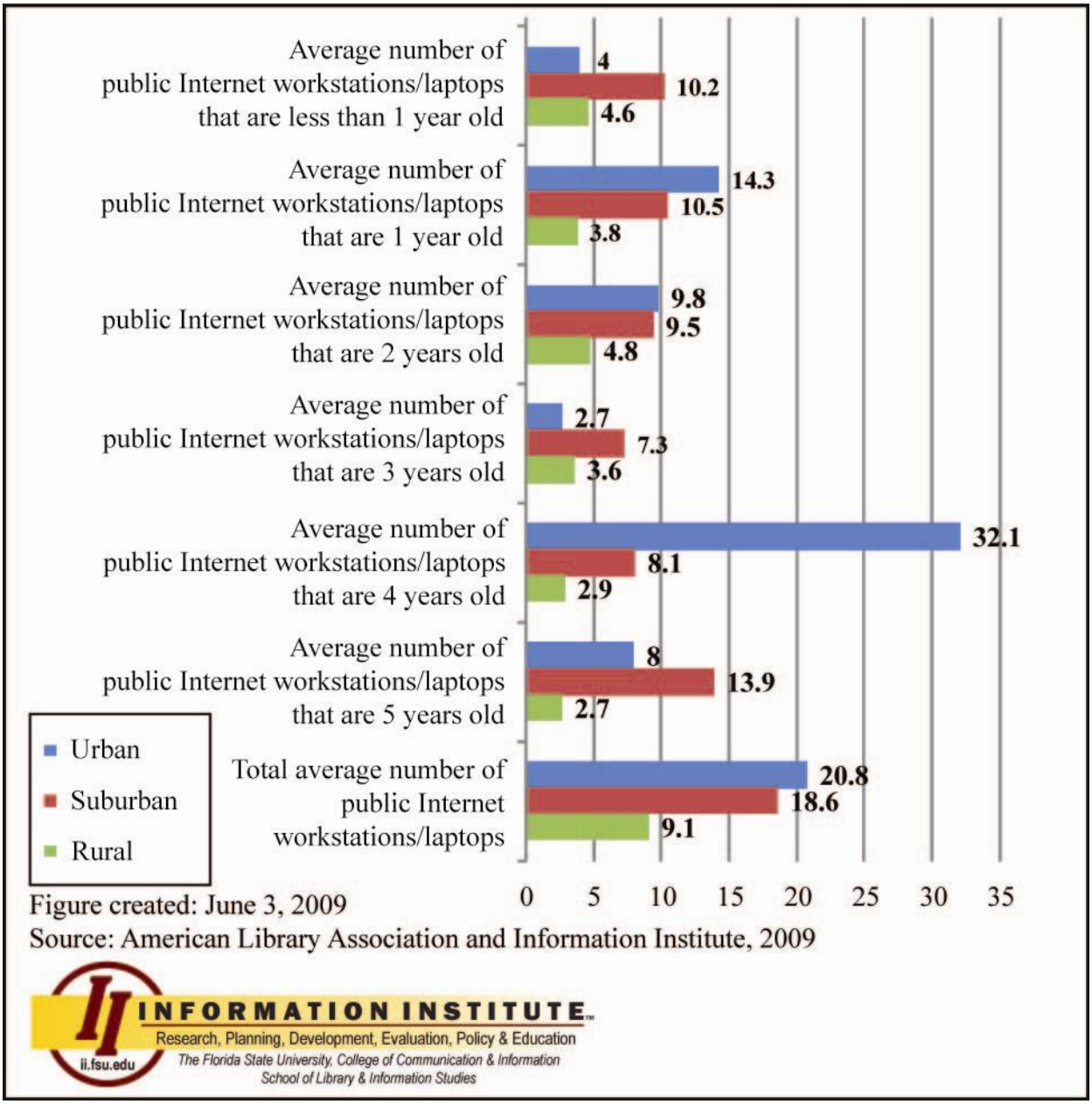

Figure 13. Average Number by Age of Public Access Internet Workstations/Laptops by MSA: Florida 2009

Summary of Current State of Broadband Access in Florida Public Libraries

Florida public libraries provide free public access Internet and Internet-enabled service roles in a context of insufficient numbers of workstations, Internet connectivity speed, and funding. Although the majority of Florida public libraries report Internet connection speeds at or above T1, over 75 percent report existing connection speeds are insufficient to meet patron and staff demand. This supports the argument that public libraries require faster Internet connections and more bandwidth than the average home user.

Increased bandwidth and faster connections will improve public libraries' ability to provide information technology training; educational, job-seeking, and E-government resources and services; and wireless and wired free public Internet access. However, faster Internet alone is not a sufficient solution for public libraries; they also require funding for infrastructure upgrades, additional and newer workstations, staff, and staff training. Funding for increased public library Internet connectivity must take into consideration these associated needs.

Broadband Mapping: Extent and Cost of Broadband in Florida Public Libraries

The study team utilized geographic information systems (GIS) mapping to analyze connectivity speeds and costs for public library outlets, schools, and school districts. Results of analysis of speed and cost connectivity are displayed statewide, by county averages, by LATA, and by RACEC, as follows:

- *Public library Internet connectivity speed and cost statewide*: This series of three maps (Figures 18-20) shows individual library outlets' connectivity speeds in comparison to each other, average annual connection costs for public library outlets in each county, and average connectivity speeds for public library outlets in each county;
- *Public library Internet connectivity speed and cost by LATA*: This series of 21 maps (Figure 21 and Figures 22-41 in Appendix E) includes one map showing the location of all 10 LATAs in Florida and two maps for each LATA, one map shows individual library outlets' connectivity speeds in comparison to each other and the other map shows individual library outlets' annual connection costs in comparison to each other;
- *K-12 public school district office Internet connectivity speed and cost statewide*: This series of two maps (Figures 42-43) shows the connectivity speeds and annual costs for public school district offices in comparison to each other; and
- *Public library, public school, and school district office Internet connectivity speed and cost by RACEC*: This series of six maps (Figures 44-49) includes two maps for each of the three RACECs in Florida, one map shows the connectivity speeds of individual public library outlets, public schools, and school district offices in comparison to each other and the other map shows the connection costs of individual public library outlets, public schools, and school district offices in comparison to each other.

The data displayed in the following maps include the Bill & Melinda Gates Foundation Florida public library technology dataset (2009) made available from the State Library and Archives of Florida as, well as school and school district broadband data (2009) made available from the Florida Department of Education. All data is for Florida only.

On maps showing Internet connection costs of individual facilities (i.e., public library outlets, public schools, and school district offices), larger symbols represent higher costs and smaller symbols represent lower costs. On maps showing Internet connectivity speeds of individual facilities, larger symbols represent higher bandwidth and smaller symbols represent lower bandwidth.

Public Library Internet Connectivity and Speed Statewide

The statewide picture of public library outlet Internet connectivity shows wide variation among connectivity speeds and costs and among regions. Although public library outlets in regions with higher populations such as Southeastern Florida and the Tampa Bay area tend to have higher connectivity speeds (Figure 18), there are library outlets with slower connectivity speeds in these areas as well as elsewhere in the state. When viewed aggregated by county, the public library data also shows variation in connectivity speeds (Figure 19) and costs (Figure 20) across the state, although rural counties (e.g., Dixie and Gilchrist) tend to show slower connectivity speeds and higher average costs.

Figure 18 provides a statewide view of the connectivity speeds at Florida public library outlets. This map demonstrates that Florida's more populated regions (i.e., Southeastern Florida, the Tampa Bay Area, Orlando, Jacksonville, Gainesville, and Tallahassee) tend to have the highest connectivity speeds. Although rural areas appear to have lower connectivity speeds on average, many public library outlets in more populated regions also continue to have low connectivity speeds and may be overshadowed by outlets in their area with much higher connectivity speeds. Note for example the quantity of public library outlets with Internet connections in the 0.1 to 1.5 Mbps range in Southeastern Florida.

Considering county averages for speed and cost of Internet connectivity in public library outlets allows the data to be viewed in the aggregate, so that the situation in one county can be compared to another. Figure 19 illustrates that each county's average connectivity speed varies considerably across the state. Some neighboring counties have similar speeds like Palm Beach and Broward, but overall the pattern is haphazard for average speeds. Only Sarasota County averages connectivity speeds over 50 Mbps (75.94 Mbps), the highest for the state. The next highest average speeds are in Indian River (50 Mbps), Charlotte (45 Mbps), and Leon (33 Mbps) Counties. These are speeds required for libraries to successfully provide E-government and emergency/disaster management services suggesting that libraries in other Florida counties struggle to provide these services successfully.

The average annual connection cost by county for the state's public library outlets (Figure 20) reveals that certain counties pay significantly higher rates for connectivity than others. For example, Dixie County public libraries pay an average of $7,129.00 annually, while Miami-Dade County public libraries pay an average of $4,874.53 annually. The range of average annual costs for public library Internet connections is from $0 (where the library gets its Internet connection from another agency free of charge) to $7,600.00 in Taylor County, the county with the highest average annual cost for public library Internet connections in Florida.

Public library Internet connection speeds and costs vary widely across Florida. Rural counties tend to have slower connections and higher prices, but urban areas also show variation among Internet connection speeds and costs.

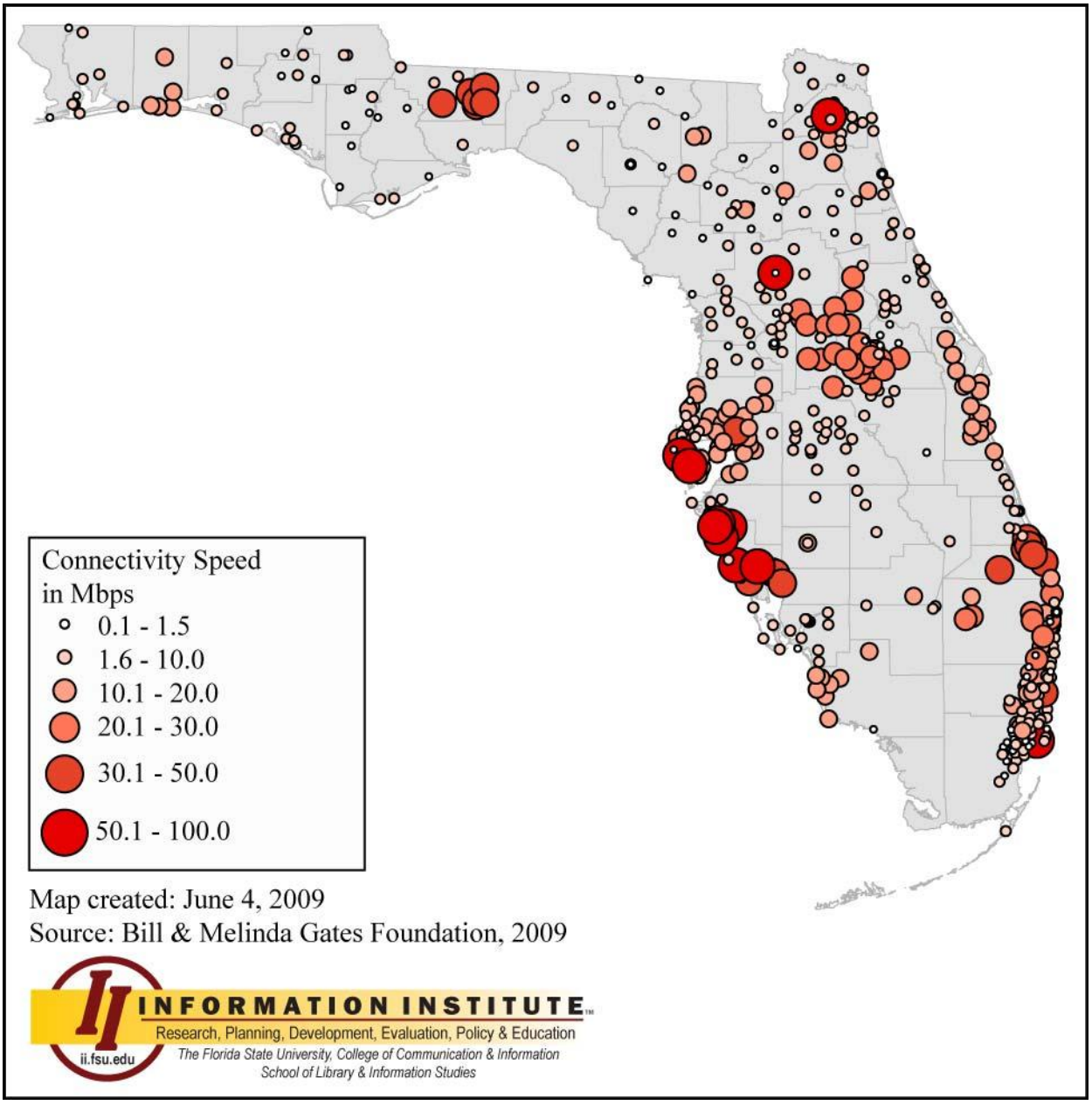

Figure 18. Public Libraries' Connectivity Speed: Florida 2009

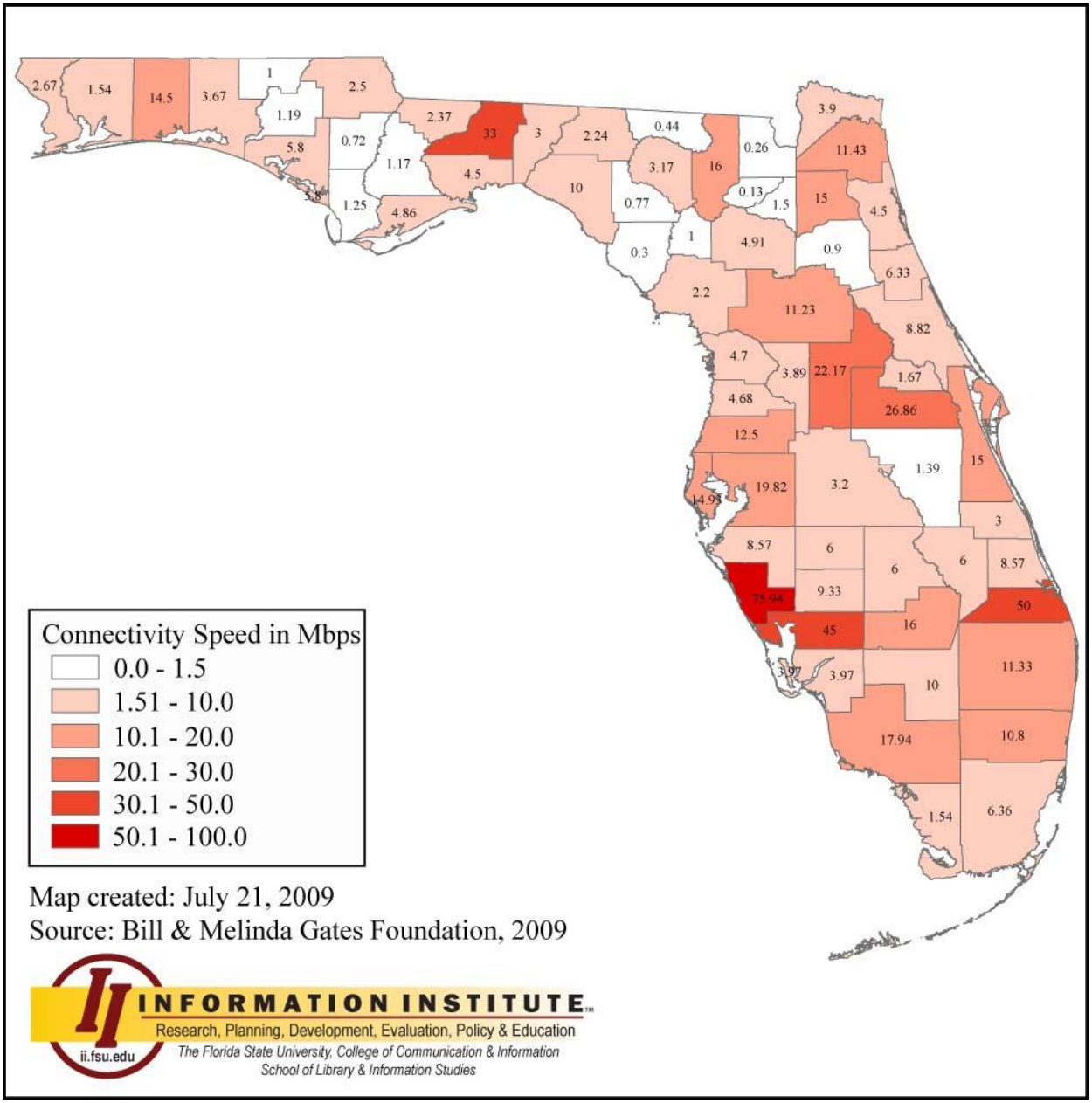

Figure 19. Average Connectivity Speed for All Public Library Outlets by County: Florida 2009

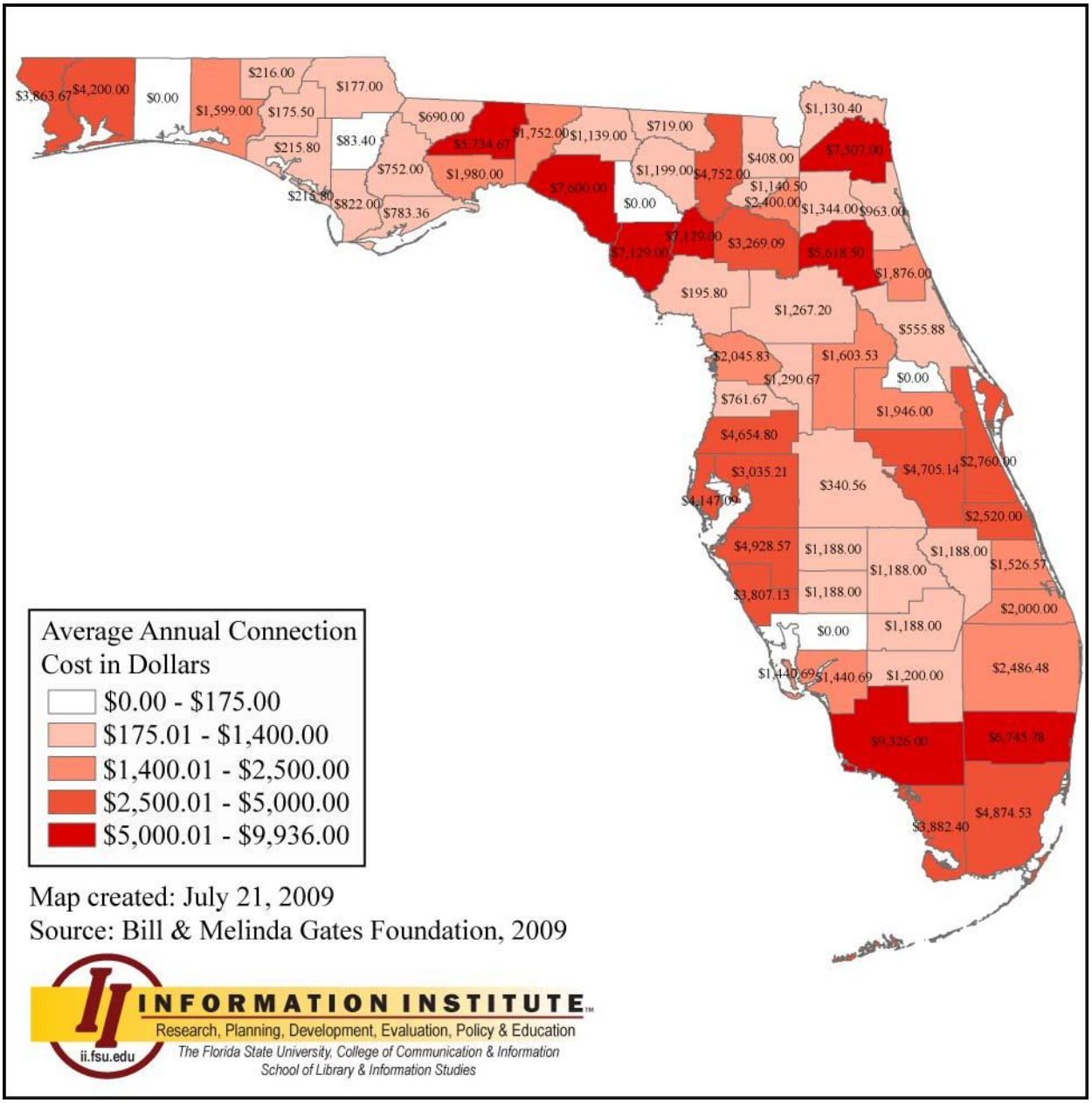

Figure 20. Average Annual Connection Cost for All Public Library Outlets by County: Florida 2009

Public Library Internet Connectivity Speed and Cost by LATA

Public library Internet service is provided within the context of the Florida LATAs, of which there are 10 (See Figure 21 for a reference map showing all 10 LATAs with their names and locations). To better understand differences in connectivity speed and price, it is helpful to view public library outlet Internet connectivity speeds (Figures 22-31 in Appendix E) and costs (Figures 32-41 in Appendix E) for each LATA. This allows comparison of speeds and costs within one LATA, as well as comparison across LATAs.

The differences in connectivity speeds among public library outlets in the populated regions of Florida may be viewed more clearly on maps of each of the 10 LATAs in Appendix E – Southeast LATA (Figure 22), Orlando LATA (Figure 23), Fort Myers Market Area (Figure 24), Gainesville LATA (Figure 25), Tampa Market Area (Figure 26), Daytona Beach LATA (Figure 27), Jacksonville LATA (Figure 28), Tallahassee Market Area (Figure 29), Panama City LATA (Figure 30), and Pensacola LATA (Figure 31).

Figure 22 depicts connectivity speeds of Florida public libraries in the Southeast LATA and, at this map's scale, public library outlets with lower connectivity speeds in urban areas are more visible than on the statewide map in Figure 18 (See above). This map shows that public library outlets in Indian River, Martin, Monroe, and St. Lucie Counties have uniform connectivity speeds within each county. For example, all Martin County public libraries have a fiber optic connection through Nuvox Communications, with 50 Mbps connectivity. In contrast, Palm Beach, Broward, and Miami-Dade County libraries experience competition between providers within their county boundaries and discrepancies of connectivity speeds that range from 1.5 to 90 Mbps.

Rural counties in Florida tend to experience slower connectivity speeds than urban counties, even in the same LATA. For example, in the Fort Myers Market Area (Figure 24), Charlotte County public libraries have higher connectivity speeds (in the 30.1 to 50.0 Mbps range) compared to the more rural Hardee, DeSoto, Highlands, Okeechobee, Glades, Hendry, and Collier Counties. However, Lee County (where Fort Myers is located) also has slower connectivity speeds than Charlotte County, showing that being located in a rural area is not the only factor contributing to slower connectivity speeds. A similar trend is visible in the Gainesville LATA (Figure 25) where libraries in more populated areas have higher connectivity speeds that libraries in less populated areas. Note that Lake County libraries are connected in the 20.1 to 30.0 Mbps range and the library in Marion County (Ocala) is connected in the 50.1 to 100.0 Mbps range while libraries in Hernando, Sumter, Citrus, Levy, Alachua, Gilchrist, and Dixie counties are connected in the 0.0 to 1.5 Mbps and 1.6 to 10.0 Mbps ranges.

Also, public libraries in the largely rural Florida panhandle experience very slow connectivity speeds compared to the rest of the state. No libraries in the Pensacola LATA (Figure 31) are connected at speeds faster than 20.0 Mbps, and no libraries in the Panama City LATA (Figure 30) are connected at speeds faster than 10.0 Mbps. In the Tallahassee Market Area (Figure 29), only public libraries in Leon County are connected at speeds faster than 10.0 Mbps, and that is most likely because Leon County is home to the State Capital, two state universities and a community college.

Viewing the cost of each public library outlet by LATA provides a similar disparity as it does when considering speeds, with annual connectivity costs ranging from $0.00 to $9,936.00. LATA cost maps appear in Appendix E – Southeast LATA (Figure 32), Orlando LATA (Figure 33), Fort Myers Market Area (Figure 34), Gainesville LATA (Figure 35), Tampa Market Area (Figure 36), Daytona LATA (Figure 37), Jacksonville LATA (Figure 38), Tallahassee Market Area (Figure 39), Panama City LATA (Figure 40), and Pensacola LATA (Figure 41). In some instances, the disparity may be related to speed or Internet service provider, but the inequality of

costs for different public library outlets is not uniform and puts some libraries at a disadvantage in providing adequate connectivity speeds at a reasonable cost.

Several LATAs show large cost disparities across the LATA. For example, libraries in the Southeast LATA (Figure 32) fall into every range of costs used on the map, from the $0.00 to $750.00 range (i.e., the lowest) to the $5,000.01 to $9,936.00 range (i.e., the highest). The same wide disparity in costs is seen in the Gainesville LATA (Figure 35), Tampa Market Area (Figure 36), and Jacksonville LATA (Figure 38), but the cost disparity is most pronounced in the Southeast LATA. In that LATA, the map shows that libraries in the lowest range geographically are close to libraries in the highest range in Miami-Dade, Broward, and Palm Beach Counties.

In other LATAs, cost variations tend to run across county boundaries. In the Orlando LATA (Figure 33), public library Internet connections fall into every category except the $750.01 to $1,400.00 range, but for the most part, libraries within one county are paying the same rate. All libraries in Brevard County have Internet connection costs in the second-highest range ($2,250.01 to $5,000.00), all libraries in Seminole County have Internet connection costs in the lowest range, and 14 of the 17 libraries in Orange County have Internet connection costs in the middle range ($1,400.01 to $2,250.00). A similar pattern is visible in the Fort Myers Market Area (Figure 34) where DeSoto, Hardee, Highlands, Okeechobee, Glades, and Hendry County libraries all have Internet connection costs in the $750.01 to $1,400.00 range but Charlotte County libraries have Internet connection costs in the lowest range and Collier County libraries have Internet connection costs in the highest range.

The three LATAs in the Florida panhandle show less cost variations across the LATA, but costs still vary across county boundaries. In the Tallahassee Market Area (Figure 39), public libraries in Leon and Taylor Counties have Internet connection costs in the highest range, and public libraries in Jefferson, Wakulla, and Madison Counties have Internet connection costs in the second-highest and middle ranges. All public libraries in the Panama City LATA (Figure 40) have Internet connection costs in the lowest two ranges, except one library in Gadsden County which has an Internet connection cost in the middle range. In the Pensacola LATA (Figure 41), libraries in Escambia and Santa Rosa Counties have Internet connection costs in the second-highest range (except one in the highest range in Escambia), the one library in Okaloosa County has an Internet connection cost in the lowest range, and the two libraries in Walton County have Internet connection costs in the middle range.

Overall, the LATA maps, like the statewide maps depicting county averages in Figures 19 and 20, show that public libraries in Florida experience wide variations in Internet connection speeds and costs. These variations exist from one LATA to another and among counties within a given LATA.

Figure 21. Florida LATAs and Market Areas

K-12 Public School District Offices' Internet Connectivity Speed and Cost Statewide

The inconsistency in Internet service provider costs and connection speeds not only affects libraries, it also affects public schools. To receive E-Rate funding, public school districts must run their Internet connections through district offices and out to individual schools. Figures 42 and 43 show that school district office Internet connection speeds and costs also vary across the state because all school systems ultimately are dependent on the incumbent provider in their area. School districts in more populated areas tend to have higher Internet connection speeds and costs, such as Miami-Dade, Broward, Pinellas, Hillsborough, St. Lucie, and Seminole school

district offices which have Internet connection speeds faster than 100.0 Mbps and annual connection costs higher than $60,000. This does not guarantee that connections at individual schools are this fast, however. Broward and Miami-Dade County School Districts each have over 200 individual schools sharing the same connection (223 in Broward and 331 in Miami-Dade).

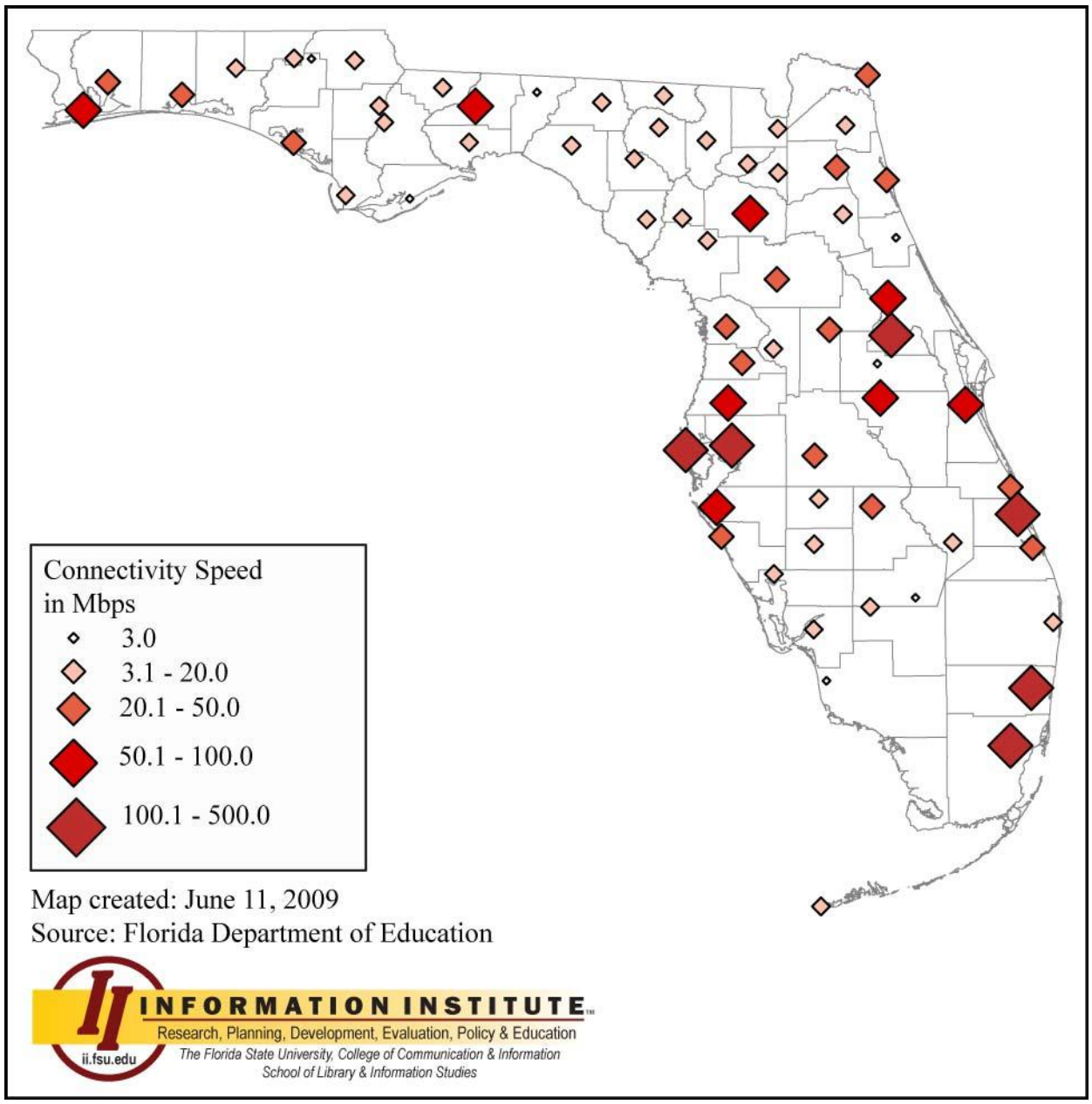

Figure 42. School Districts' Connectivity Speed: Florida 2009

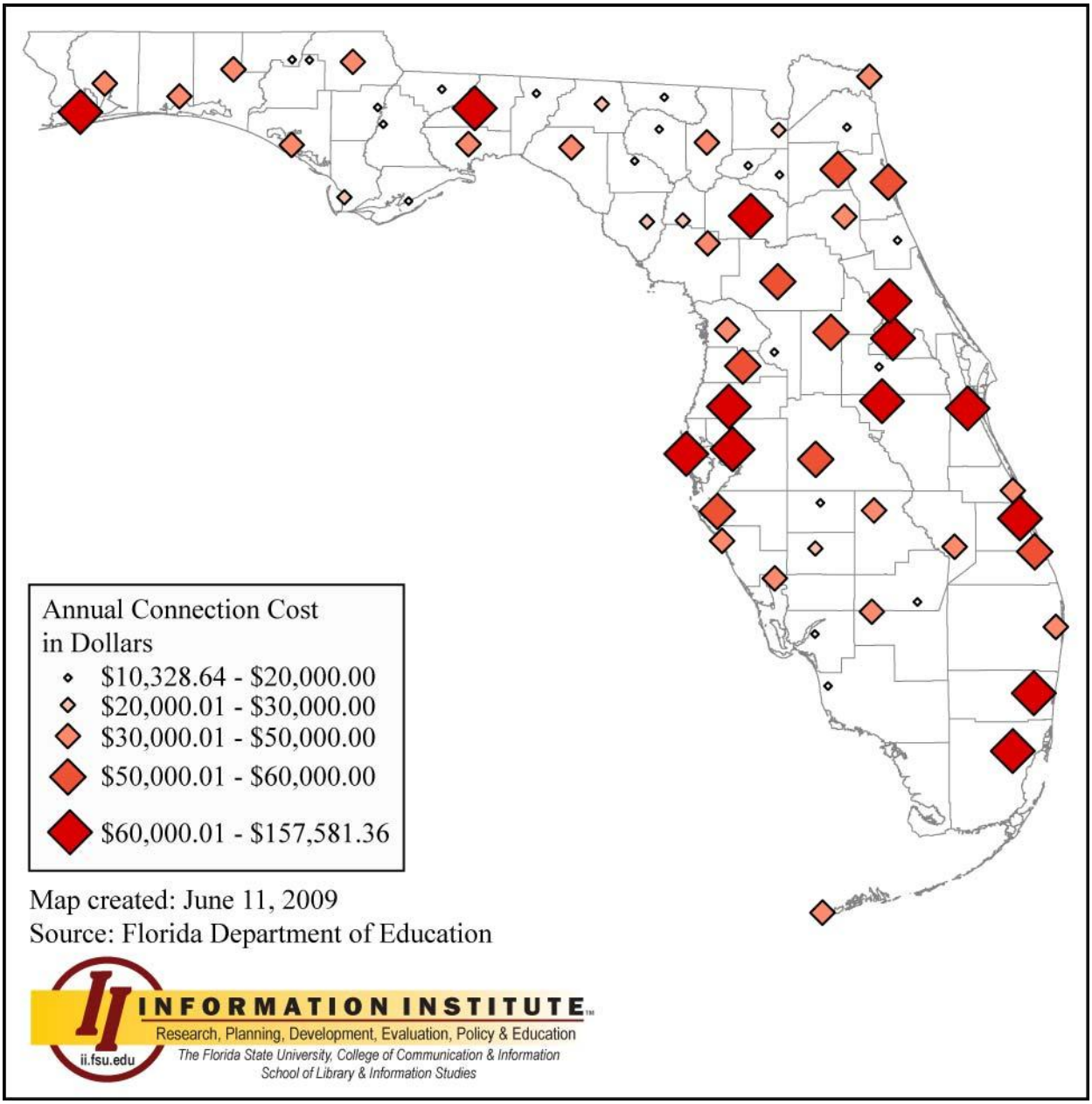

Figure 43. School Districts' Annual Connection Cost: Florida 2009

Public Library, Public School, and School District Office
Internet Connectivity Speed and Cost by RACEC

Generating maps of public library outlets alone does not explain the whole story of Florida broadband. For this study, school and school district broadband data from the Department of Education was also analyzed and mapped for each of the 28 counties in the three RACECs (i.e., Northwest, North Central, and South Central). Viewing library outlets in conjunction with public schools and school district offices shows connection speed (Figures 44-46) and cost disparities (Figures 47-49) across entities within a given county and RACEC. This

is especially evident when looking at maximum connection speeds of public library outlets (100.0 Mbps) versus school district offices (500.0 Mbps) versus public schools (1000.0 Mbps, or 1 Gbps). These higher maximum speeds also result in higher maximum annual connection costs for public schools ($301,301.88) versus school district offices ($157,581.36) versus public library outlets ($10,000.00). All of the RACEC maps show that public schools have the widest variation in connectivity speeds (0.0 to 1000.0 Mbps) and costs ($0. to $301,301.88), when compared to public library outlets and school district offices.

The number of entities in a geographic area can create difficulties in seeing all entities represented on a map. The quantity of data portrayed on each map and creates a challenge in representing multiple entities (i.e., public library outlets, public schools, and school district offices) that are located within a few miles of each other. Each RACEC map depicts the entire RACEC which requires zooming out to a level where entities in close proximity may appear overlapping (e.g., on the eastern edge of Bradford County in Figure 44, there appears to be a library on top of a school district office on top of a public school), or one entity may obscure another. Notably, the connectivity speed maps (Figures 44-46) appear to be missing many school district offices, but these are actually located so close to schools and library outlets that the symbols for the district offices are obscured.

Connectivity speeds vary widely within each RACEC, whether comparing schools to libraries to district offices, or libraries to libraries, schools to schools, etc. In the North Central RACEC (Figure 44), public school connection speeds vary from the lowest range (0.0 to 1.5 Mbps) to the highest range (1 Gbps), and represent all speeds in between. Public library outlets and school district offices in this RACEC do not have the same wide variation in connection speed, with library Internet connection speeds only ranging from 0.0 to 20.0 Mbps and all school district offices in the 3.1 to 20.0 Mbps range. Similar disparities exist in the Northwest (Figure 45) and South Central (Figure 46) RACECs where public school Internet connection speeds range 0.0 to 999.0 Mbps but public library outlet connection speeds do not exceed 20.0 Mbps and all but one school district office connection speed (Highlands County in the South Central RACEC) also do not exceed 20.0 Mbps.

Like Internet connection speeds, costs for Internet connectivity vary widely across the different entities in the RACECs. In the North Central RACEC (Figure 47), public school connection costs fall into all cost ranges, from the lowest to highest, while public library outlet annual costs do not exceed $10,000.00 and school district costs do not exceed $157,581.36. In the Northwest (Figure 48) and South Central (Figure 49) RACECs, public school connection costs max out at the $30,000.01 to $250,000.00 range, but again school district annual costs do not exceed $157,581.36 and public library outlet costs are even lower, maxing out at the $0.01 to $2,500.00 range.

It is helpful to consider Internet connection costs in relation to connectivity speeds offered. Overall in the RACECs, public schools shoulder the highest connection costs but also benefit from the fastest connection speeds. In contrast, public libraries are paying less for their Internet connections but also receiving less bandwidth. School district offices tend to fall in between the public schools and public libraries for both Internet connection costs and connectivity speeds.

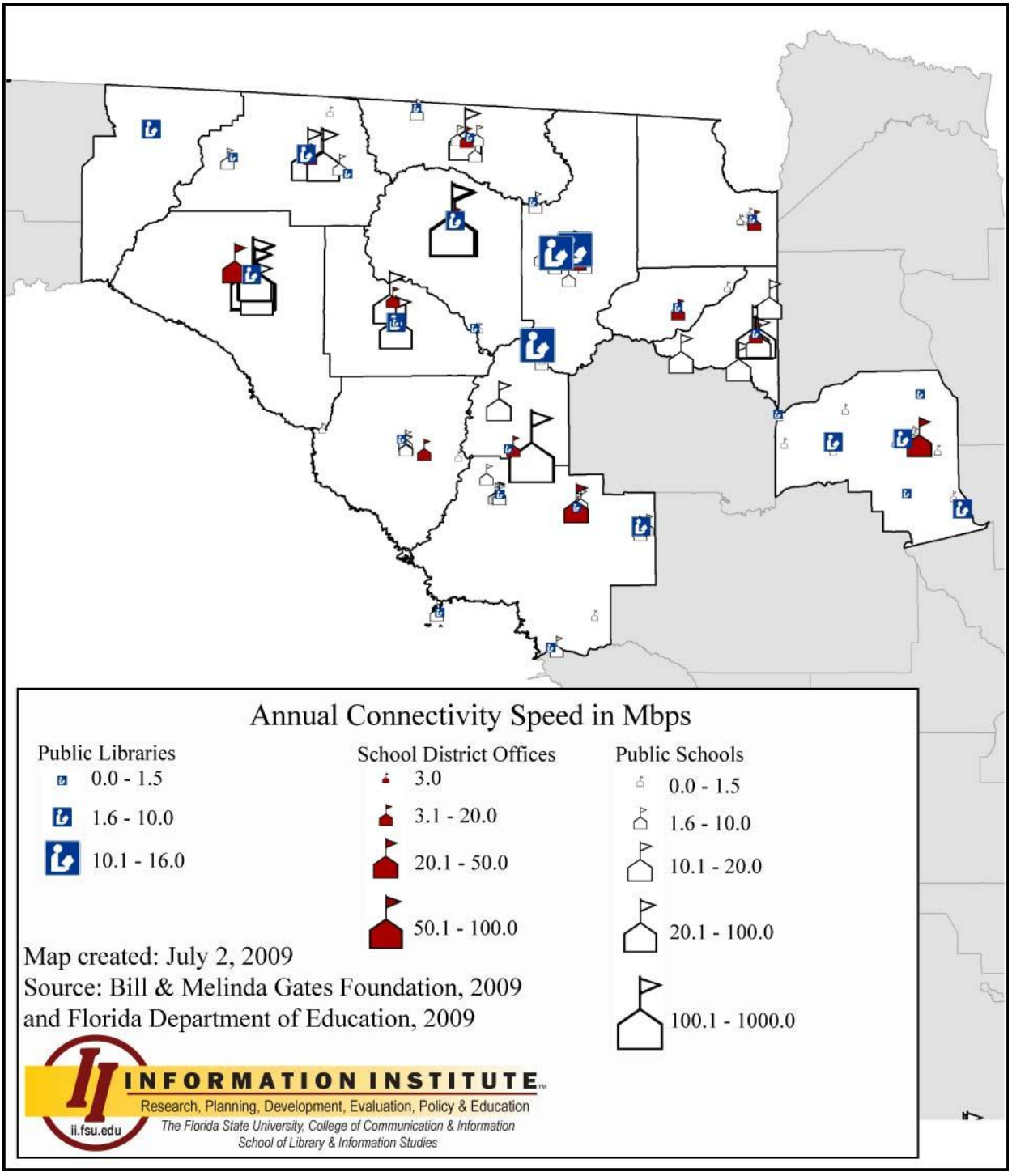

Figure 44. Public Libraries, K-12 Schools and School District Offices' Locations and Connectivity Speeds: North Central RACEC, Florida 2009

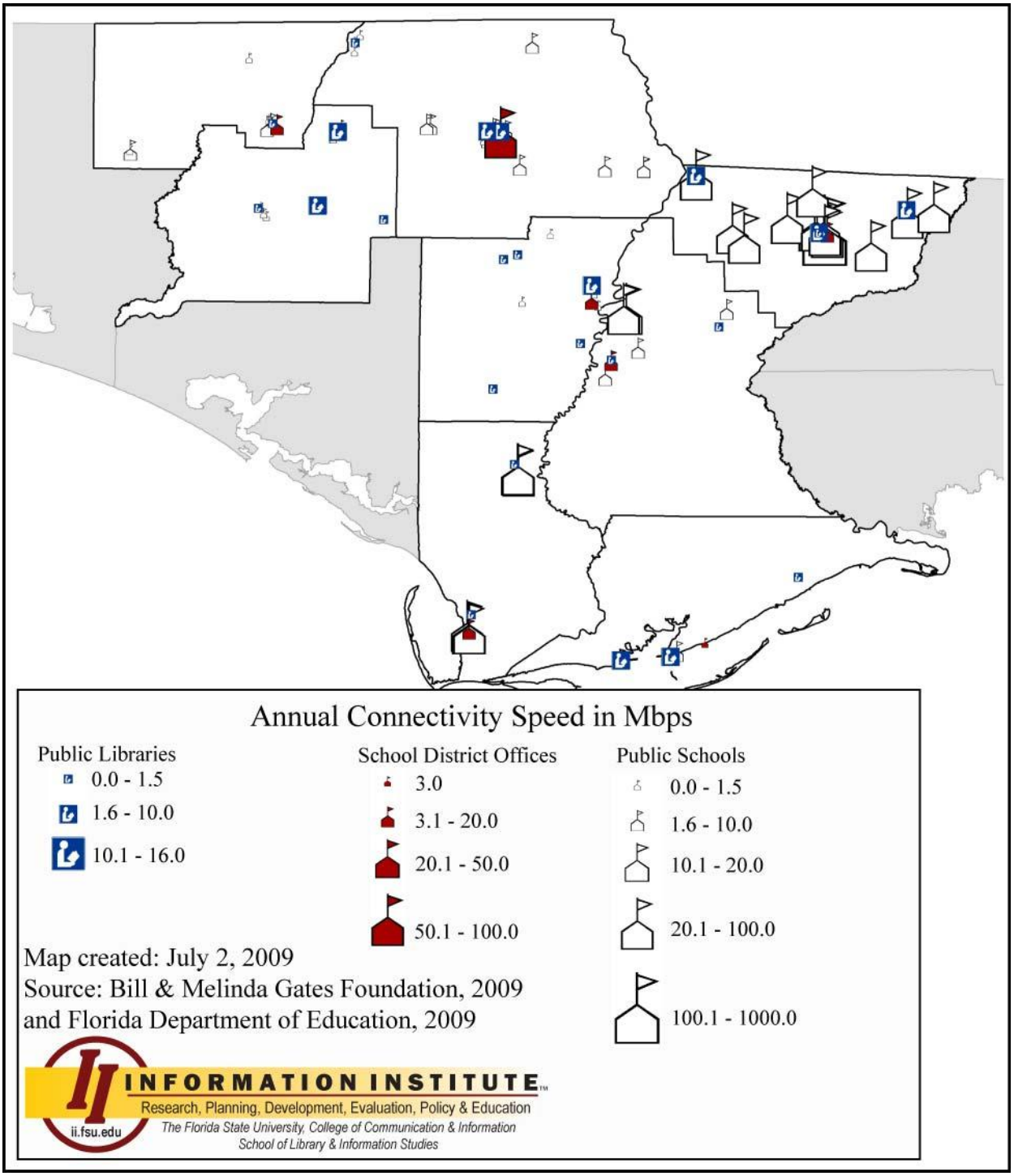

Figure 45. Public Libraries, K-12 Schools and School District Offices' Locations and Connectivity Speeds: Northwest RACEC, Florida 2009

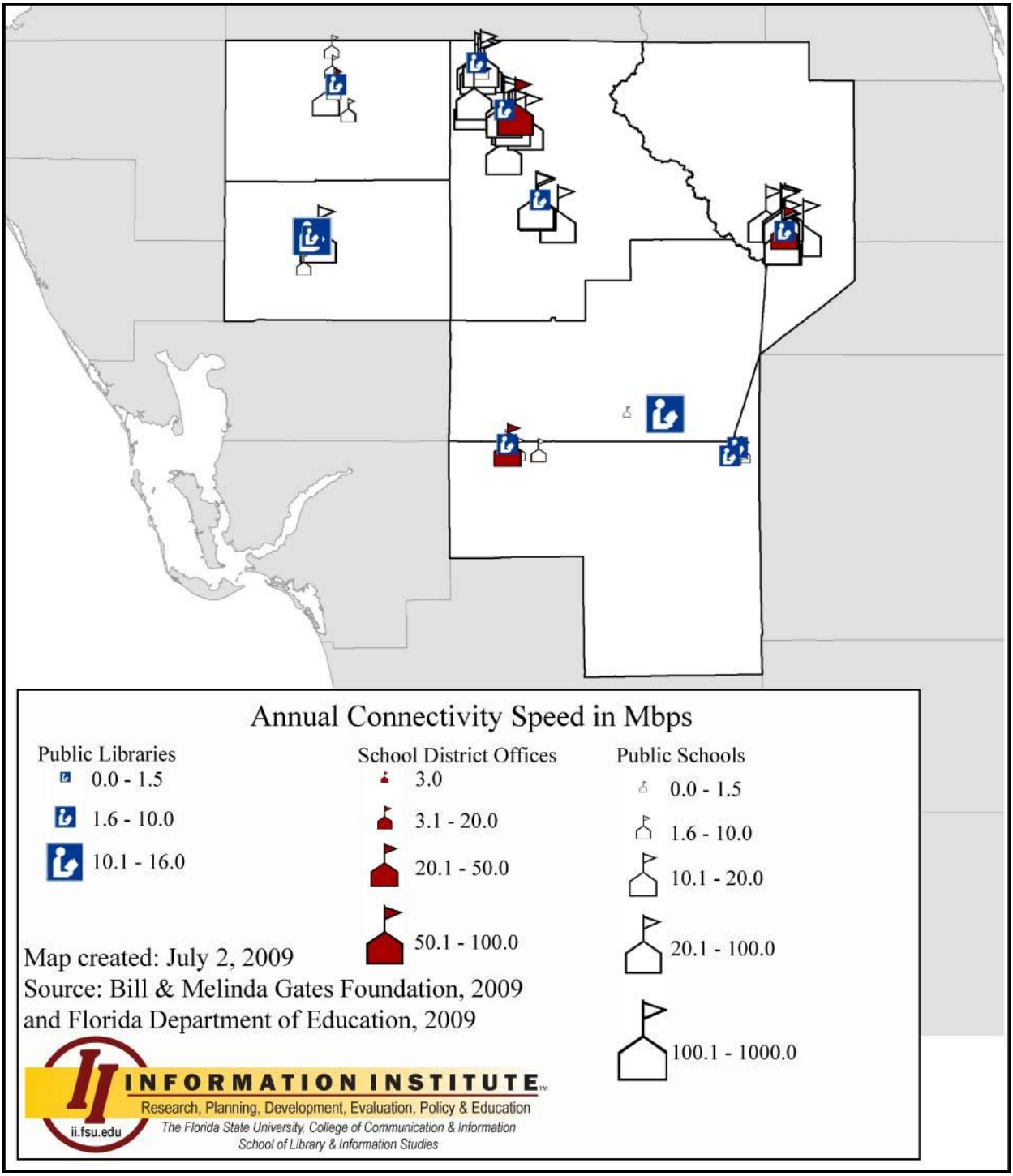

Figure 46. Public Libraries, K-12 Schools and School District Offices' Locations and Connectivity Speeds: South Central RACEC, Florida 2009

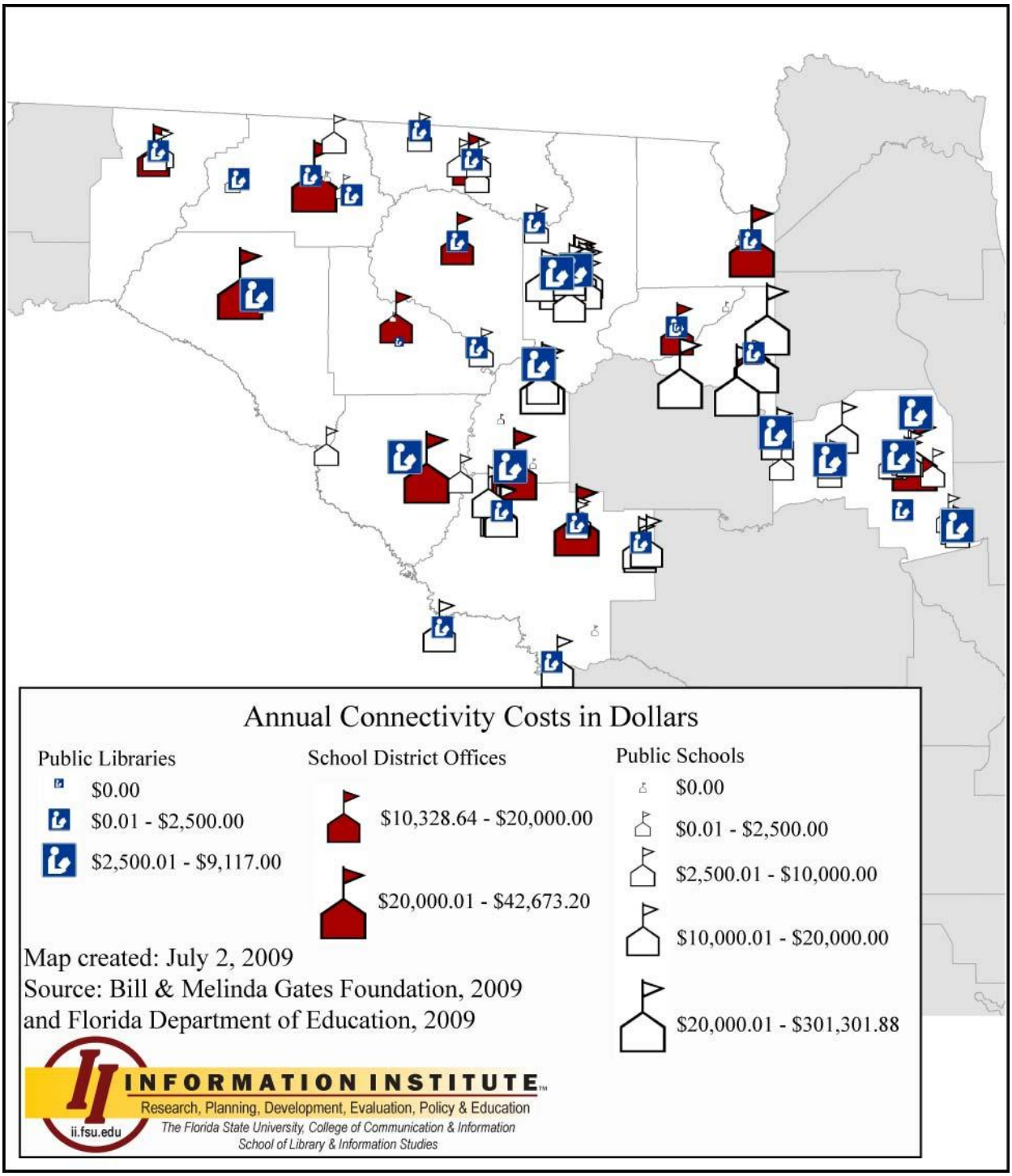

Figure 47. Public Libraries, K-12 Schools and School District Offices' Locations and Connection Costs: North Central RACEC, Florida 2009

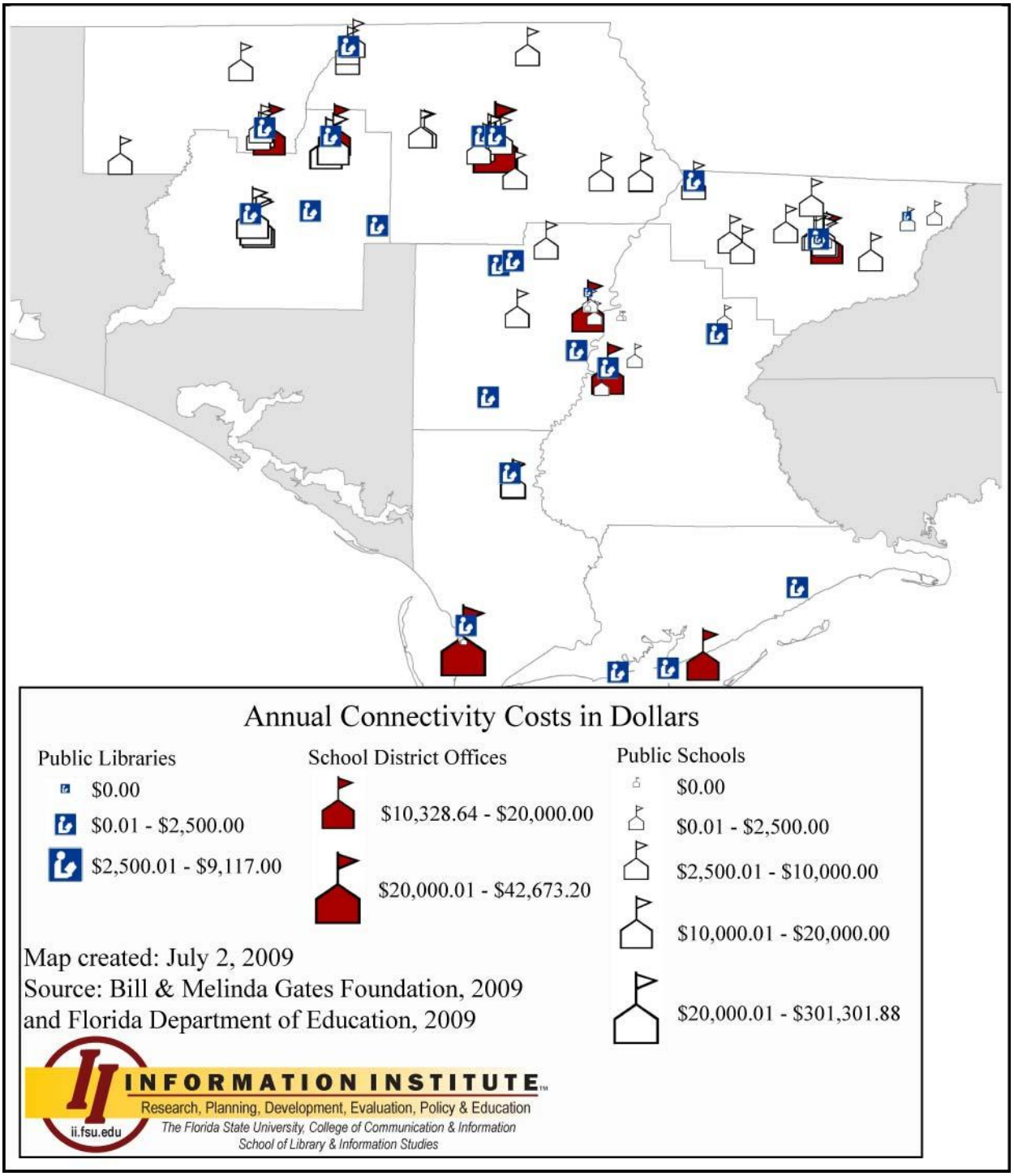

Figure 48. Public Libraries, K-12 Schools and School District Offices' Locations and Connection Costs: Northwest RACEC, Florida 2009

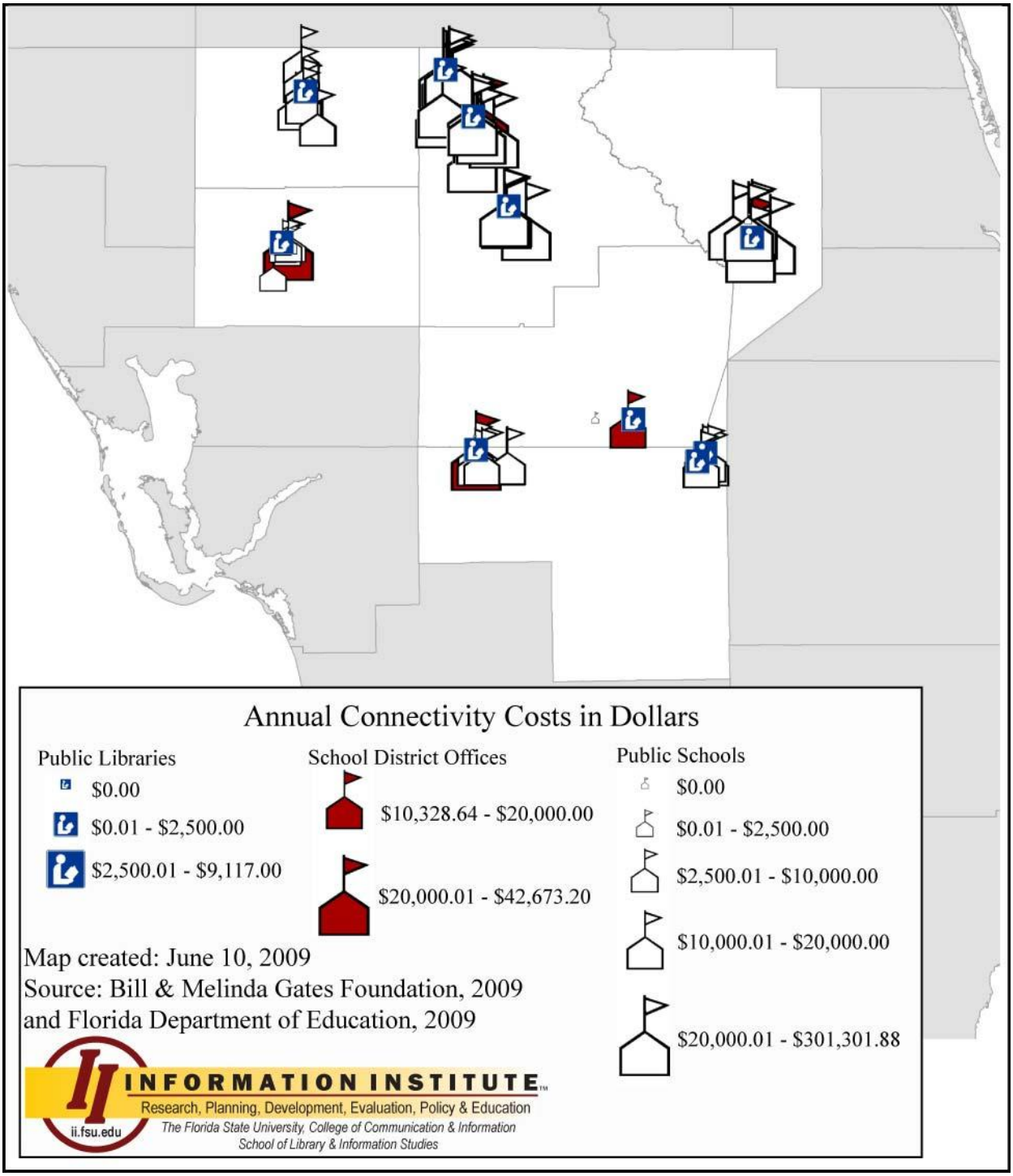

Figure 49. Public Libraries, K-12 Schools and School District Offices' Locations and Connection Costs: South Central RACEC, Florida 2009

Summary of Broadband Connectivity Extent and Cost in Florida Public Libraries

Results of analysis of speed and cost connectivity were displayed in several maps in a variety of ways: statewide, by LATA, and by RACEC. The maps highlight the disparate Internet connectivity speeds and connection costs that Florida public library outlets, public schools, and school district offices experience. Overall, connection speeds and costs vary across the state, vary within LATAs and RACECs, and vary by entity served (i.e., public library outlets, public schools, and school district offices). For some public entities, relatively high connection costs pose a financial burden whereas others may receive free Internet connections, such as public schools in Taylor County which receive free Internet connections on the school districts fiber line. For all types of entities, connection speeds impact the level of services offered to the public. This impact is felt most in public libraries which tend to have slower connection speeds than do both school district offices and individual public schools no matter their geographic location.

E-Government and Emergency/Disaster Management Service Roles

E-government (electronic government) is the use of information and communications technologies to provide government services and enable a more interactive relationship between the government and its citizens. Emergency/disaster management services include public community information hubs, disaster recovery centers, and evacuee resources, among others.[6] Florida public libraries already provide a range of E-government and emergency/disaster management services, many of them on an as needed basis. These services could be provided in a more formal manner if public libraries had access to higher bandwidth broadband connections.

This section of the report offers an approach to describing levels of broadband-enabled E-government and emergency/disaster management services for Florida public libraries. BTOP-funded public library stimulus projects will enable two levels of services: basic and advanced, with two possible models –partnership and web services. Figures 50-52 (below) describe the basic level and both models of the advanced level. An individual public library's ability to provide each level of service will depend on the critical success factors described in Figure 53, with the most critical factor being the amount of high-speed broadband available to the library.

Basic Level Services

ALA notes that visits to libraries and use of computers in libraries have increased substantially in recent years. Specifically, "Our nation's 16,592 public library locations serve more than 97 percent of Americans in communities large and small. Over the past decade, libraries at the national level have reported increased visits – now reaching almost 1.4 billion annually – and use of public computers has climbed to over 330 million each year" (ALA Office for Research and Statistics, 2009b, p. 3). This increased use requires libraries to provide at least the basic level of broadband-enabled E-government and emergency/disaster management services as detailed in Figure 50.

[6] For more detail on public library emergency/disaster management service roles, see the discussion of service roles on the Information Institute's *Hurricane Preparedness and Response for Florida Public Libraries* web portal, at http://www.ii.fsu.edu/hurricanes/librarians.html.

Some of this use is due to government agencies increasingly providing services over the Internet. For example, nearly 90 percent of Florida Department of Children and Families (DCF) applications were submitted electronically via the Internet by June 2008 (ALA Office for Research and Statistics, 2009b). Along the Gulf Coast, public libraries provided Internet access and assistance with FEMA forms in the wake of the 2004 and 2005 Gulf Coast hurricanes. Based on these and other public need services, the public associates public libraries with free Internet access and trusts library staff members to assist them in the use of E-government services (Gibson, Bertot, & McClure, 2009).

In over half of Florida communities (55.6 percent), the library provides the only free access to computers and the Internet (ALA and Information Institute, 2009). In Florida, 93.8 percent of libraries report providing as-needed assistance with E-government services and 51.9 percent help with applying for and/or accessing E-government services (ALA and Information Institute, 2009). Additionally, public libraries assist patrons in obtaining email accounts (Bertot, Jaeger, Langa, & McClure, 2006) and provide computer and Internet training critical to public use of E-government services (ALA and Information Institute, 2009).

However, without stimulus funding to increase broadband access, public libraries across the country are struggling to provide even the basic level of these services. Nearly three-quarters (72 percent) of Florida public libraries report that their Internet connection speeds are inadequate to meet patron needs some or all of the time (ALA and Information Institute, 2009). These figures demonstrate greater Internet connection insufficiency in Florida than the national average (59.6 percent). Also, a vast majority of these Florida public libraries (87.4 percent) report that they do not have enough computers to meet patron demand some or all of the time. This insufficiency is compounded by the time limits 96.5 percent of Florida public libraries impose on the use of their public access workstations, most of which limit patrons to 60 minutes or less.

Based on the results of this current broadband needs assessment, E-government services provided by Florida public libraries include:

- Access to and assistance navigating E-government web sites;
- Assistance filling in forms and sending send e-mails related to obtaining forms;
- Help writing employment letters and resumes, completing employment and unemployment applications, and searching employment databases; and
- Locating government information such as hunting and fishing licenses, Florida Homestead exemptions, government assistance and grants, Medicare benefits, immigration and naturalization regulations, tax forms, vital statistics, etc.

Florida public libraries also provide community disaster response services by serving as disaster recovery centers, providing evacuee assistance, acting as communication and information hubs, and more (McClure et al., 2009).

Achieving this level of public library broadband-enabled services in Florida will extend a basic level of E-government and emergency/disaster management services uniformly throughout the state. This basic level of service is important because it seeks to meet citizen demand for last

resort Internet service in each Florida community in terms of broadband connection speed, availability of workstations, and provision of adequate time to identify appropriate E-government resources and services, understand their use, and make applications to obtain government benefits. Figure 50 below describes the basic level of public library broadband-enabled E-government and emergency/disaster management services.

Objective: Seek to meet existing demand by reacting to resident and visitor requests for Internet service.

Specifications:

- Emphasis on meeting Internet public access demand not assisting in individual use;
- Primary training assistance continuing to emphasize on demand, one-on-one training focused on basic computer literacy and E-government service;
- Little or no follow up with users; and
- No systematic survey of needs.

Why it matters:

- Government is increasingly using the Internet to interact with citizens without a guarantee that citizens will have access to the Internet or know how to use it;
- Government agencies are referring citizens to public libraries for Internet access and assistance filing forms online;
- Public libraries may offer the only public access to the Internet available to citizens; and
- Existing public library Internet services, in the absence of broadband stimulus, are inadequate to meet citizen demand.

Service level examples:

- Providing as-needed assistance with accessing or navigating government web sites, completing forms, or otherwise being able to access or use government services;
- Offering basic computer and Internet instruction so patrons can access E-government services and resources;
- Securing e-mail accounts or other basic requirements for using E-government services;
- Reacting to catastrophic events by assisting those applying for disaster recovery assistance; and
- Assisting those applying for unemployment insurance and other social service benefits.

Key critical success factors:

- Broadband connection speeds;
- Internal network infrastructure improvement; and
- Sufficient workstations.

Indicators of basic service level:

- Little or no wait for workstations and increase in recorded number of uses;
- Increase in length of time allowed per use;
- Increase in number of workstations, including laptops and netbooks;
- New availability of wireless where it previously did not exist or increased wireless carrying capacity; and
- Increase in average speed available at the workstation.

Figure 50. Basic Level of Public Library Broadband-Enabled E-Government and Emergency/Disaster Management Services

Advanced Level Services

Nationally, public libraries have been reluctant to expand their Internet services beyond the basic level of broadband-enabled E-government and emergency/disaster management services because of uncertainty regarding their capacity to sustain expanded services. The advanced level expands Internet-enabled E-government and emergency/disaster management services in at least three directions: for residents and visitors, government agencies, and use of broadband technologies.

Advanced level services focus on bringing public libraries beyond the basic level of broadband capacity which can support improved broadband at the community level. Provision of an advanced level of public library broadband-enabled E-government and emergency/disaster management services could enable other institutions, such as schools, hospitals, and local community businesses also to increase broadband capacity and add local broadband-enabled content to the Internet. This level can be approached via two models – the partnership model (Figure 51 below) and the web services model (Figure 52 below). Also, libraries might consider a hybrid model that includes elements of both the partnership and web services models.

The Partnership Model

This model of advanced level services is important because it increases partnerships between public libraries and other government agencies, thereby improving E-government and emergency/disaster management service provision. This model is characterized by sophisticated partnerships with federal, state, and local government agencies. For example, the Alachua County Library in Florida has entered into a partnership with the Florida Department of Children and Families and over 25 other participating Florida agencies to offer neighborhood social services and a library in one location – the Neighborhood Resource Center (Daniels, 2009).

Previously, the absence of required technology, available staff and government agency partnerships made it pointless for public libraries to identify E-government and emergency/disaster management needs. The public library broadband stimulus initiative, however, is now making it possible for libraries to consider expanding E-government and emergency/disaster management services to the advanced level – partnership model. This service level is important for the public library to meet the needs of public service personnel to communicate with local residents in a timely and effective manner. Figure 51 below describes the partnership model of the advanced level of public library broadband-enabled E-government and emergency/disaster management services.

Objective: Identify resident and visitor needs for E-government and disaster services and work with government agency partners to meet those needs, using broadband technology applications where possible.

Specifications:

- Expand services to residents and visitors by identifying needs for E-government assistance and provision where possible;
- Expanded service to government agencies through partnerships designed to better meet resident and visitor needs; and
- Partnerships with other agencies to avoid duplication of effort.

Why it matters:

- The public library broadband stimulus initiative makes it possible to take a fresh look at identifying E-government and disaster needs;
- Partnerships between library and other government agencies in one area may lead to other useful arrangements; and
- Public service personnel are aware of residents' needs for e-government and disaster management broadband-enabled content but lack capacity to produce it and make it available on library web sites.

Service level examples:

- Liaison between local, state, and federal government agencies and patrons in need of help;
- Planning appropriate collaborative responses to community E-government and disaster preparation and recovery needs with government agencies and others;
- Constituent briefings, surveys and virtual town hall meetings allowing elected officials to present their work and rapidly gather new data in support of legislative action; and
- Identifying existing E-government and disaster broadband-enabled applications among library partners.

Key critical success factors:

- High speed broadband Internet connection speeds for public libraries and government agency partners;
- Improved communications among partners; and
- Sufficient workstations, telecommunications, computer and public service staff.

Indicators of basic service level:

- Annual identification of the number and type of public library and government agency partnerships related to E-government and disaster preparation and response;
- Annual identification of the number and type of E-government and disaster management broadband-enabled applications and services provided by libraries and partners; and
- Annual survey of the increase in public library, telecommunications, computer and public service staff providing E-government and disaster related services.

Figure 51. Advanced Level of Public Library Broadband-Enabled E-Government and Emergency/Disaster Management Services – Partnership Model

The Web Services Model

The web services model of advanced level services is characterized by advanced telecommunications applications and knowledgeable library staff. This model is important in that access to additional broadband services can increase use of broadband-intensive applications such as the federal government's Data.gov and emergency/disaster management websites and applications. Increased access to E-government and emergency/disaster management web sites and applications through the web services model provides better access for more individuals who may not otherwise have access to these services and resources. Broadband will be necessary to make these services available to everyone, as noted by Federal Chief Information Officer Vivek Kundra (2009). This further justifies broadband deployment to all public libraries. Figure 52 describes the web services model of the advanced level of broadband-enabled services.

Objective: Focus on giving public libraries the capacity to add broadband-enabled content to the Internet, as well as making the capacity available to the local community.

Specifications:

- Technology such as web cams and video editing equipment to produce short videos;
- Staff to produce localized content (e.g., webmasters, videographers, and instructional designers);
- Identification of resident needs; and
- Expanded use of broadband technologies, including identification and use of existing E-government and disaster management broadband Internet applications.

Why it matters:

- The number of bandwidth-intensive applications will increase, but only so far as broadband stimulus increases local resident access to high-speed Internet; and
- A range of disaster preparation materials, benefits applications and instructions, and weather information require broadband Internet capacity for use.

Service level examples:

- Subject based organization of E-government and emergency/disaster management web sites;
- Production of webinars, tutorials and training materials in frequently used areas;
- Production of tourism, business, and disaster related Internet content in partnership with local agencies and businesses; and
- Viewing full motion weather and radar maps.

Key critical success factors:

- Applications, staff and technology that allow local public libraries to produce advanced Internet content and make it available on the Web;
- Internal infrastructure improvement; and
- Very high speed connections, state of the art internal infrastructure improvements, and increased numbers of workstations, telecommunications, computer and public service staff.

Indicators of basic service level:

- Annual number of locally produced web content items.

Figure 52. Advanced Level of Public Library Broadband-Enabled E-Government and Emergency/Disaster Management Services – Web Services Model

The Hybrid Approach

Some libraries might consider a hybrid approach to offering advanced levels of broadband-enabled E-government and emergency/disaster management services. This hybrid approach would be especially useful for libraries that can form limited partnerships with multiple government agencies or more extensive partnerships with only one government agency and have access to broadband-enabled applications beyond the basic level but not quite at the advanced level, web services model. These libraries could choose the specifications and service levels from Figures 51 and 52 that they feel they could best meet. This would enable the libraries to go beyond the basic level of broadband-enabled E-government and emergency/disaster management services even if they cannot fully achieve either the partnership model or web services model of advanced level services.

Critical Success Factors in Deploying Public Library Broadband-Enabled Service Levels

There are numerous factors that are critical to successful deployment of the two levels of public library broadband-enabled E-government and emergency/disaster management services. Figure 53 describes selected critical success factors and why each is important to public library broadband-enabled E-government and emergency/disaster management service deployment. A public library's ability to address some or all of these critical success factors will determine the potential level of broadband-enabled services a library can provide to the community it serves.

Connection to the door: Bandwidth provided to the libraries' doorstep
Why it matters: Determines upper limit of number of workstations and users who can be supported at one time, as well as type of broadband-enabled applications available.

Internal infrastructure: Routers, switches, wiring, load management, etc.
Why it matters: Bandwidth available at the door step may be lost by poor equipment and wiring, poorly designed or installed networks, and other internal infrastructure.

Telecommunications staff: Assess bandwidth need, design network architecture, bid and negotiate telecommunications pricing, install and maintain equipment, and optimize bandwidth
Why it matters: Telecommunications experts can mitigate problems of overpaying for broadband connections or losing capacity by planning and maintaining internal telecommunications infrastructure.

Workstations and peripherals: Workstations (including laptops and netbooks), broadband-enabled technologies, and peripheral equipment (e.g., printers, scanners) available for public use
Why it matters: Workstations are the most visible portion of a public library's broadband capacity.

Computer staff: Develop a technology plan, purchase, install and maintain information technology
Why it matters: Needed to negotiate, purchase, and maintain equipment according to a well-designed plan.

Public service broadband assistance: Plan and deliver broadband-enabled services, including training and aid offered by the library
Why it matters: Public libraries can maximize broadband services if they have staff comfortable with the technology and familiar with how to aid the public.

Availability of broadband-enabled E-government and disaster management aids: Internet services available to assist the public in E-government and disaster management
Why it matters: The public needs broadband-enabled aids to identify needed E-government and disaster management services, understand what they do, and how to use them.

Technology capacity to produce broadband-enabled aids locally: Enabling local production of broadband-enabled content for Web distribution (e.g., webcams and video editing software)
Why it matters: Broadband Internet is necessary to produce materials facilitating the use of E-government and disaster management resources and to serve as the local center to help local businesses, agencies and the public learn how to be broadband-enabled content producers.

Application staff to produce broadband-enabled aids locally: Produce broadband-enabled content
Why it matters: Knowledgeable personnel are necessary to create localized broadband-enabled content

Agency responsibility: Responsibility for government agency programs, benefits and services
Why it matters: The public library is asked to explain programs, services and benefits to residents via Web-based or other publications but not provided with knowledgeable local or other staff to do so

Public library liability: If public library personnel, making their best effort, provide incomplete or false information or assist a resident making an application that is later rejected
Why it matters: Librarians need clarification of federal, state and local liability laws as they relate to public libraries

Figure 53. Critical Success Factors in Deployment of Public Library Broadband-Enabled E-Government and Emergency/Disaster Management Services

Summary

These two proposed service levels for E-Government and emergency/disaster management offer challenging goals for Florida public libraries. Indeed, the vast majority of Florida public libraries are likely not to be qualified even for the basic level, given the limited broadband, internal network infrastructure, and staff to assist in E-government and emergency/disaster management services as outlined in the above tables. Thus, significant efforts must be made to provide the necessary broadband, internal network, workstations and other production/telecommunications equipment, and technical staff necessary for public libraries to consider offering advanced levels of service, along either the partnership model or web services model.

Case Studies and Site Visits: Internet Connectivity in Florida Libraries

One aspect of the needs assessment was to obtain more detailed and specific information about public library broadband connections at the front door; the network configurations that deploy connections throughout libraries and library systems; the personnel involved in managing and maintaining connections, workstations, and networked services; the *actual* speed of connections at workstations; library organizational factors and relationships with other local agencies regarding network access and use; and other local factors that affect the public's access to and use of the broadband connection.

Approach

To obtain this information, the study team invited six libraries to participate in case studies and asked them to collect data related to the following activities:

1. Provide a written network configuration for the library network beginning with the bandwidth coming into the system (library), and explain how all the branches and outlets are connected, with what, and at what speed;
2. Report the telecommunications/broadband costs for the current network and name of the ISP;
3. Do some speed tests at the workstation level using www.speakeasy.net (or another preferred online speed test) over a one week time period at a selection of library system branches, preferably around 9:00 AM and 4:00 in the afternoon on weekdays with Monday, Wednesday, and Friday as suggested days;
4. Supply anecdotes or stories about problems or issues regarding connectivity and bandwidth at the branch level;
5. Describe the internal size of the library technical staff and the amount/type of assistance received from the ISP;
6. Draw the DREAM configuration that the library wishes it had for a broadband connection (based on number one above) and indicate what the costs would be with the current provider; and
7. Send all this material to the Institute and then schedule a quick conference call to discuss it.

The six participating libraries included two located in large metropolitan areas, two relatively small libraries in rural settings, and two libraries that can be characterized as moderate in size and serving both suburban and rural clientele.

The extent to which staff at each of the libraries completed all of these activities varied from library to library. Some dedicated an extensive amount of time and effort to collecting data on these activities, others less so. Some of the participants called upon very sophisticated city/county technical staff for assistance, but others had no external (or internal) "expert" staff and addressed the activities as best they could. The range and extent of the conference and other calls between the libraries and the study team also varied widely. Although the findings from this portion of the needs assessment cannot be generalized statewide to all Florida public libraries, the study team believes that the findings from the case studies are especially useful, informative, and illustrative of the broadband situation for other public libraries in Florida.

Findings

The requested data collection activities, the various email exchanges, the phone calls, and the conference calls generated an extensive amount of data and information. In fact, the data provided by participants often included information beyond that actually requested. This section provides a brief summary of key findings from the case studies. The findings discussed are those that relate most directly to describing Florida public library broadband needs, costs, services, and E-government/disaster management services.

Broadband Needs

Many of the libraries initially suspected that their existing broadband connection was inadequate for the various applications and demands being placed on it. A number of the libraries provided examples and anecdotes that depicted the limited bandwidth and minimal connection speeds they had, such as the following:

- Users complained frequently that response time at the workstation was "very slow" and asked staff what was "wrong" with the workstations;
- Internal network monitoring software showed that network load was above 95 percent and sometimes above 100 percent between 11:00 AM and 6:00 PM;
- "The DSL that our ISP provides is very unpredictable. The service is very erratic. When you have more than four patrons on the computers the bandwidth drops. Patrons get very upset when they get disconnected and lose their work.";
- Specific applications simply froze at the workstation and the workstation had to be re-booted;
- Polycom video conferencing could not operate among branch libraries during the afternoon because of lack of bandwidth; and
- "I come to download a Bible study video to my zip drive only to find out that the best speed I can get is WORSE than dial-up. This is unacceptable."

These are but a sampling of the comments and examples obtained from the case studies. Each library had extensive examples and user anecdotes depicting the existing inadequate broadband

service to the library. See Figure 54 for a summary of Internet uses that impact broadband needs that was developed based on information provided by one of the case study participants.

1. *Different levels of use at different times of the day*: For example, between 4:00 PM and 6:00 PM when children are doing homework and engaging in leisure activities and adults are on their way home from work and stop at the public library to check email, do online banking, and leisure activities, the Internet is very slow. Sites like Google take a few seconds to show results, but the time from clicking the results link in Google to the linked page actually showing up takes even longer, even though three people who earlier performed these activities on the same computers presented no problems. Streaming video sites like YouTube, Vimeo, etc. take even longer.

2. *Sharing the network between library staff and patrons*: This means that when staff needs to check email, answer information questions, and conduct other library business, they find that they experience slow response times similar to those listed above.

3. *Slow-loading documents*: Adobe (PDF) file formats take more time to load particularly at peak computer usage times. Many online government forms and information are in PDF format and this creates an obstacle for patrons who are seeking government information.

4. *Completing online forms*: Patrons doing banking, completing job applications, applying for government assistance and small business owners filing forms online complain that their computer usage time has expired while waiting for forms to load.

5. *Additional resources required to utilize advanced Web tools*: The growth of multimedia tutorials and webinars has led employers to require online training sessions. For example, the local school board requires their staff to view online videos and tutorials as part of their continuing education requirements. Many of these employees access this information at the public library, but viewing multimedia tutorials requires more speed and bandwidth. Contractors and small business owners also use library computers to meet continuing education requirements that require viewing online videos. Some state-required contractor continuing education courses, such as those on the new building code, also require viewing online video tutorials.

6. *Increasing demand for live streaming video*: As an example, a County government recently held focus groups in order to seek citizen input on the County's strategic plan. The public library sponsored a live online focus group so that citizens could participate via computer and in person.

7. *Filing online forms and other Internet activities in the wake of disasters*: Public libraries have been used to file online forms, such as FEMA forms, following natural or man-made disasters. Often electricity is not restored to homes immediately following a disaster and the public library is used by residents who want to contact family via email and file forms in order to receive assistance. The public library also may have a book/cyber mobile located in areas where citizens need Internet access and this would require increased broadband.

Figure 54. Example Issues Impacting Broadband Needs in a Florida Public Library

Broadband Cost Categories

The case studies validated the various cost categories that this study intended to use in the cost logic model (see next section). In general, these are the following basic cost categories related to public library broadband services and resources:

- *Broadband connection speed to the front door*: This is the cost the ISP charges the library for its basic connection to the Internet; in some cases, there may be multiple ISPs or connections coming into the library or individual branch libraries.
- *Telecommunications and network equipment*: These costs include switches, routers, and cables, a range of telecommunications and network infrastructure equipment, and network management tools, as well as installation and maintenance of the equipment.
- *Workstations, printers, WiFi, servers, etc.*: These costs are related more directly to user services, but depending on the size of the library, number of branches, and number of workstations, costs in this category can be substantial.
- *Staff*: There are a number of different types of staff that support broadband services, for example technical staff (e.g., telecommunications and network managers, maintenance staff, and developers) and public service staff who assist users on a day-to-day basis in various applications, perform on-demand workstation and printer support, and provide training. There may be another category of staff required to assist the State Library plan, deploy, administer, and evaluate a statewide, BTOP-funded broadband initiative.

These categories do not include costs associated with electricity, other utilities, or administrative overhead, all of which increase the overall costs related to broadband.

The costs that an individual public library pays for its broadband are largely dependent on which ISP is providing service to that library and the success with which that library has negotiated its service contract with the ISP. Data were collected for this study during the spring of 2009, and at that time most public librarians were not familiar with the new statewide contract in place for broadband connections and services through AT&T. When members of the study team discussed the availability of this new contract, the costs for particular types of connections and services available, and showed them the "calculator" provided by AT&T to estimate broadband costs and services, there generally was some confusion in understanding the new contract and the implications of the contract for *their* library.

The case studies showed that while the general cost categories are similar across the various libraries, the actual amounts of the costs vary considerably from library to library. For example, the cost of a T3 (44.7 Mbps) connection to the front door at one library versus another can be quite different, network configurations differ in size and complexity, and costs associated with technical staff vary considerably. In addition, some library costs are embedded in costs that are charged against other organizations or in some instances provided "free" to the library. Finally, there is a need for public librarians to better understand the range of contract options for broadband services available from AT&T, as well as other ISPs.

Network Configurations

Both the case studies and follow-up interviews asked about the libraries' network configurations. Although it is difficult to generalize findings regarding these configurations because of a range of situational factors that affect the networks, the following observations can be made:

- *Degree of control*: Some public libraries are dependent (to varying extents) on a broadband connection that comes first through the county, a municipality, a school, or by other means. In such instances the library has limited to no control over the configuration in place, as well as the range of other network management factors.
- *Limited general knowledge about broadband and networking*: While all of the interviewees and case study participants could identify slow workstations and recognize problems with the access to and use of broadband, many library staff have a limited understanding of the different types of broadband, what broadband is exactly, how broadband speeds and network configurations affect applications at the workstation, the need and importance of broadband at the workstation to exploit a range of applications, and other issues. While it can be argued that not everyone needs to have this expertise, there clearly is a need for additional education and training in broadband use and applications for many library staff.
- *Need for high-speed broadband*: There is considerable variation among public librarians' knowledge and understanding about the need to have high-speed broadband. Some interviewees recognized that one 50 Mbps connection coming in the front door was woefully inadequate for their needs and applications. Yet others failed to understand that only getting a T1 connection to the front door was a problem. In short, a number of public librarians are unaware of *why* high-speed broadband connection is necessary, *what* broadband speed is needed, and do not know *what* they would do with a 50 Mbps connection even if they had it.
- *Limited cloud computing*: Cloud computing is a structure that utilizes the capabilities of the Internet to run multiple applications through a Web browser requiring less user-side memory and allowing for scalable storage space and maximum availability of resources. Few public libraries are using such networking configurations although many computing and network experts expect cloud computing to be an essential aspect of the next generation of computer networks which will require significant broadband access at the workstation.
- *Multiple types of and differing components in network configurations*: The descriptions of network configurations from the case studies and interviews varied considerably due to local situational factors. For example, one library had broadband provided by two different ISPs and had a number of different networks operating within the library system. Another was entirely dependent on its county government for its connection and network management. Thus, the most critical needs for upgrading a library's broadband may vary considerably from library to library.

These are some of the primary observations that resulted from discussions regarding Florida public library network configurations.

Space does not permit a detailed discussion of all the various network configurations provided to the study team. Most of the case study sites provided the study team with a graphic representation of their current network configuration and their "dream" configuration. These graphics cannot be reproduced in this report due to their file size and inability to visually represent in a vertically-oriented print report. Nonetheless, these configurations range from incredibly complex and dynamic configurations with multiple internet connections, cloud computing, and multiple switches, servers, and routers to very straight-forward configurations with one T1 line coming from the ISP to the library connecting 12 workstations, a switch, and a server via Ethernet.

Front Door versus Workstation Connection Speeds

An important finding of this study is that libraries need to recognize that the broadband speed at the front door is not the actual speed available at the workstation. Broadband access, deployment, use, and services provided are significantly reduced by the time the connection leaves the front door of the library and before it is available at the workstation. The basic pressure points that affect the broadband speed at the workstation include the following:

- *Broadband speed at the front door*: Although an ISP may contract with the library to provide a 20 Mbps connection, for example, the actual speed coming to the library can be considerably less. Only if the ISP makes a "commitment of service" statement of 20 Mbps in the contract is it likely that 20 Mbps actually is coming to the library. Network "sniffers" and other tools can determine what broadband speed actually is available as it comes into the library.
- *Library network and telecommunications configuration*: The manner in which the library network is configured, deployed, moves through various switches, servers, and routers, and is otherwise managed can result in significant loss of bandwidth at the workstation. One network technical expert interviewed by the study team commented that it was common for 20-30 percent of the available broadband in libraries to be lost by the time it reaches the workstation, specifically because of poor network management, out-of-date and inefficient switches, etc.
- *Number of workstations, wireless routers, and other peripherals*: The larger the number of workstations, wireless routers, and other peripherals that are connected to the network and the greater the number of these items that are in use at the same time, the larger the effect on the amount of bandwidth at the workstation. Of special concern is the number of wireless routers on the network since each provides access to the network for multiple users.
- *Age of workstations, wireless routers, and other peripherals*: Generally speaking, the newer the workstations and other peripherals that are on the library's network, the less bandwidth that is required to run various applications or the better the workstations and peripherals use and manage the bandwidth available.
- *Type of applications in use*: Internet-accessed applications range from those requiring relatively little bandwidth use (e.g., text-only email) to bandwidth hogs (e.g., interactive high resolution videos). The more applications that are bandwidth hogs operating on the network at any one time, the less broadband speed there will be at the workstation.

These factors taken together affect the *load* on the network and ultimately determine the *drop-off rate* and the broadband speed at the workstation. The experts in network management interviewed for this study said that libraries should have a goal of having a minimum of a consistent T1 connection (i.e., 1.5 Mbps) at the workstation.

To better understand the actual connection speeds at the workstations, most of the case study libraries completed speed checks using www.speakeasy.net, or other similar applications. Some examples of the findings from these tests at one library include the following:

- Advertised ISP front door speed was 40 Mbps when actual speed at the workstation was typically 35 Mbps;
- With a 35 Mbps connection at the front door of the main library supporting 21 branch libraries with numerous workstations and peripherals at each branch, workstation speed at one branch registered a speed of 19 kbps for downloads at 2:30 PM on a sample weekday afternoon; and
- On weekdays the network capacity reached or exceeded 95 percent almost every day between 11:30 AM and 9:30 PM.

At one of the small rural libraries that had an advertised T1 line at the front door, the download speed at one of the workstations was 5.4 kbps for a weekday afternoon. Other libraries reported much higher speeds at the workstations than the ones discussed above. These speeds resulted, in part, from very high advertised connection speeds at the front door and very impressive network management and deployment techniques. But overall, the libraries experienced significant drop in bandwidth at the workstation between noon and 6:00 PM.

The detailed network management context for each of the libraries participating in the speed tests is only partially known to the study team. Thus, it is very difficult to determine the primary culprits (from the above list) responsible for such significant drop-offs in connection speeds from the front door to the workstation. This discussion of connection speed at the workstation, however, stresses the importance of understanding and managing a range of factors other than the speed at the front door in determining the actual available speed at a specific workstation or wireless connection.

Staffing

The extent to which the library employs or has access to staff with technical and network expertise varies widely. Some libraries have no staff with technical expertise, some have a staff person who serves this role but has been self-taught, some have good to high quality technical staff that work for the library or are contracted from outside the library, and some have exceptionally well-trained technical staff either within the library, contracted, or who work for the associated municipal government.

The interviews and case studies demonstrate that the degree to which high quality technical staff is available to the library affects the nature and effectiveness of the broadband connection and deployment. For example, at one library the county network manager that was

assigned to work with the library had exceptional technical knowledge about telecommunications, contract negotiation, network management, and configurations for the network to maximize efficiencies in moving bytes through the network. In addition he had a most interesting and innovative vision for what the dream network configuration for the library should or might be. Such expertise and vision is essential for the library to maximize its management and use of broadband.

E-Government and Emergency/Disaster Management Services

In the case studies and interviews, a number of libraries commented on the increased role the library plays in the provision of E-government and emergency/disaster management services. One medium sized library system maintains statistics related to E-government services and noted the following between December 2008 and May 2009:

- Library staff dedicated 1,778 hours on E-government related activities;
- Library staff answered 641 E-government questions at the branches;
- 147 residents attended five E-government workshops;
- The library's E-government blogspot was viewed 7,353 times; and
- During a one month period between March and April 2009 the library's E-government section of its website was viewed 879 times.

While not all Florida public libraries may be as heavily engaged in the provision of E-government services as this library, previous research conducted by the Information Institute has documented the growing involvement of public libraries in E-government services (Gibson et al., 2008) and especially hurricane preparedness and response (McClure, Ryan, Mandel, Brobst, Hinnant, & Snead, in press).[7]

Findings from this needs assessment as well as work done by the Information Institute in describing service roles and activities that libraries provide related to hurricane and other emergency management services suggest a number of findings. First, there has been a significantly increased demand for E-government and emergency management public library services and access to electronic resources that require additional broadband because of both the number of service requests related to a range of different government agencies that are being made and the applications and resources that require greater amounts of high speed broadband to operate effectively.

Secondly, the capacity of public libraries to provide these E-government and emergency management services and resources is being compromised due to a number of reasons, such as the following:

- *Budget cuts*: The Florida property tax amendment that reduced local property taxes statewide, the housing bubble, and the national recession have resulted in overall budget cuts of some 30-40 percent at some Florida public libraries which has caused

[7] For more information, see the *Public Libraries and Hurricane Preparedness and Response* web portal: http://www.ii.fsu.edu/hurricanes

reduced staffing. This reduction in staff limits the ability of the library to provide one-on-one assistance to users attempting to complete E-government applications;

- *Internet speeds at the workstations*: The oftentimes limited bandwidth available at many branch workstations results in patrons being unable to access E-government services in a timely fashion or to use E-government applications and resources because those resources require significant broadband;
- *Referrals to the public library for assistance*: The increased occurrence of state agencies (e.g., Department of Children and Families) referring Florida residents to public libraries to obtain E-government services often leaves those libraries with inadequate bandwidth and workstations to meet demand. In addition, there are often limits placed on the amount of time available to a user in using the workstation, thus complicating the completion of a job application or other form. For example, if the form cannot be completed in the available 30 minute time period, the patron ends up frustrated and with an incomplete form;
- *Hurricane evacuees*: When thousands of evacuees arrive from a hurricane-struck area to other areas in the state, the public library is often the first source of information contacted and the library staff are typically overwhelmed with the provision of networked and electronic resources; and
- *Broadband needed for emergency management services*: In order for public libraries to serve in various emergency management roles, they require sophisticated high-speed broadband and equipment for networked communication and other applications.

These are only some of the demands on public library broadband capacity for provision of E-government and emergency management services. In addition to these issues, state government offices increasingly "off-load" and refer government services to Florida public libraries.

Overview of Case Studies

The case studies provide a wealth of information describing the broadband connections at select Florida public libraries, as well as identifying a number of key issues that affect the quality of the broadband available to users at the workstations. Overall, most of the librarians were shocked at the drop-off in the connection speeds from the front door to individual workstations at the branches. Participants in the case studies and interviews also made clear that although their libraries wanted to improve broadband, they simply had little resources and staff time to do so. The lack of high speed broadband at the workstation for some libraries significantly decreases their ability to provide E-government and emergency/disaster management services. Finally, the case studies suggest that *if* the library can double or triple the bandwidth speed at the front door, many of the public libraries in Florida also will need assistance in how to manage, configure, and deploy that increased bandwidth and how best to use that bandwidth for user services and applications.

Estimates of Public Library Upgrade Costs

The study team investigated several models for estimating costs to upgrade Florida public libraries' broadband connectivity utilizing BTOP funding. The study team developed the models

by considering a number of situational and technological factors to accomplish the upgrade, while following BTOP guidelines under the Public Computer Center (PCC) funding program.[8] Ultimately, the study team, working in concert with the State Library, developed a menu of equipment options from which libraries selected the equipment they needed, and then tabulated a total cost of all necessary upgrade equipment for libraries participating in the State Library's BTOP grant program.

Developing Cost Logic Models

The original intent was to develop a cost logic model that considered purchasing additional bandwidth through the statewide AT&T contract, with libraries differentiated by population size and demographics. The team provided AT&T each public library's location, current connectivity speeds and annual costs and requested broadband upgrade costs and speeds for all 547 Florida public library outlets. This method would have resulted in a cost logic model along with total costs for upgrades in all Florida public libraries or only the libraries in the RACEC counties. However, based on the NTIA Notice of Funding Availability (NOFA), which would not cover costs for broadband upgrades in the PCC program, the team abandoned the plan to upgrade library bandwidth.

Instead, the team developed a set of four models to upgrade internal equipment that can facilitate faster speeds at the public access workstations, including switches, routers, workstations, etc. Working with the State Library and a State of Florida certified minority vendor (State Certified Vendor), the study team developed four cost models based on library facility square footage:

- Small libraries: outlets with less than 5,000 square feet;
- Medium libraries: outlets between 5,000 and 10,000 square feet;
- Large libraries: outlets between 10,000 and 20,000 square feet; and
- Extra large libraries: outlets between 20,000 and 40,000 square feet.

These models assume that libraries participating in the statewide program would upgrade their bandwidth to meet the NTIA broadband definition at the workstation (768 kbps downstream and 200 kbps upstream) by utilizing the statewide AT&T contract pricing and E-Rate discount.

In addition to developing four facility size-based models, the study team created a menu of extra equipment available for libraries, including, laptops and laptop carts. Each laptop cart includes 20 laptops and battery rechargers that fit in the securely locked cart for easy storage and recharging. The carts are designed to allow libraries to expand the number of available PAC workstations without remodeling or expanding library facilities, as well as serving as a mobile training lab to expand public training options.

Although all Florida public libraries fit into the size ranges outlined above, once the State Library began soliciting libraries to participate in the program it became evident that

[8] For more information, see the BTOP Notice of Funding Availability (NOFA): http://www.broadbandusa.gov/files/BB%20NOFA%20FINAL%2007092009.pdf

systematized cost models would not work well for the Florida public libraries. The situational factors that impact Florida public libraries' broadband Internet access and service provision also impact the utility of the cost models. Each library has unique technology and service needs and the libraries could not easily be placed into a set of cost models, whether by population, facility size, or any other criterion. Instead, the study team worked with the State Library and the state certified vendor to develop a menu of equipment options from which libraries could select only the equipment they need – regardless of their size or community context.

Developing the Equipment Menu

Similar to the previously developed cost models, the equipment menu (Figure 55) relies on the AT&T state contract pricing for workstations, software, laptops, switches, routers, and services. Services include onsite network efficiency assessment, individualized consulting time, and evaluation of program success. The State Library provided the menu to each public library to select the equipment necessary to upgrade that library's public access computing to current FCC broadband standards.

The study team analyzed the *PLFTAS* data to estimate the number of PAC workstations requiring replacement in Florida libraries. The data indicate 30 to 50 percent of Florida public library PAC workstations are three or more years old. Also, case studies and informal conversations with Florida librarians as part of the previously discussed needs assessment, show some libraries still relying on routers and switches installed in 1996, equipment that is outdated and inadequate to meet broadband standards. The State Library asked libraries to indicate equipment needing replacement to enhance network efficiency, including workstations three years or older, old routers, switches, and other equipment.

Menu prices include installation, maintenance, pre-installed software, individualized onsite network efficiency assessments, and program evaluation. Consulting and evaluation efforts are charged on a per-outlet basis.[9] General upgrade equipment and software available through the statewide PAC workstation upgrade program include the following:

- ***PAC Workstations and Software***: All workstations are HP Compaq dc5800 PCs with an Intel Core 2 Duo E7500 processor, 2 GB RAM, 80 GB hard drives, keyboard, optical mouse, 20-inch LCD flat-screen monitor, DVD-R/W drive, USB ports, and wireless card, running Windows XP operating system with Microsoft Office 2007, Symantec antivirus, Symantec Ghost Solution (imaging), and Deep Freeze (system integrity);
- ***Mobile Training Labs***: These notebook mobility carts are lockable for security and hold 20 laptops and battery re-charging stations; all laptops are HP Compaq 6730b notebook PCs with an Intel Core 2 Duo (2.26 GHz) processor, 2 GB RAM, 160 GB hard drive, DVD-R/W drive, touchpad, keyboard, wireless card, and 6-cell lithium-ion battery, running Windows XP operating system with Microsoft Office 2007, Symantec antivirus, Symantec Ghost Solution (imaging), and Deep Freeze (system integrity);

[9] The total cost for 9 consultation hours plus program evaluation was divided by the number of participating outlets to assure an equal distribution of these service costs across participating Florida public libraries.

- ***LAN Equipment***: Based on individualized assessments of library needs, routers, switches, cables, telecommunications and network infrastructure equipment, and network management tools will be provided; and
- ***Installation, Labor, and Remote Monitoring***: A state certified vendor will conduct site visits at each participating public library outlet to assess the existing network infrastructure and how to improve efficiency, set up and install all equipment, and provide 24/7/365 remote monitoring, on-site service, maintenance, and repair for the duration of the BTOP program.

Figure 55 is an explanation of the equipment menu. The goal of this approach is to aggregate purchasing and facilitate smooth, quick upgrades for Florida public libraries, in keeping with the BTOP's goals of leveraged federal dollars and expedient deployment.

EQUIPMENT	COST
1 PAC workstation, including all software	**$1,225.91**
1 laptop cart with 20 laptops and recharging docks	**$16,850.00**
1 router	**$5,780.00**
1 switch	**$2,000.00**
Wireless installation/upgrades for small libraries	**$6,746.77**
Wireless installation/upgrades for medium libraries	**$8,594.30**
Consulting and evaluation costs, per outlet	**$579.20**

Figure 55. Menu of Equipment for Florida Public Library Upgrades

Based on the menu detailed in Figure 55, the State Library created spreadsheets to send to each library system in Florida that had indicated interest in the statewide BTOP program. The spreadsheets included all equipment in the menu plus consulting and evaluation hours, all with projected costs. These spreadsheets were designed to make it easy for librarians to indicate to the State Library what equipment they need in order to upgrade their computing capacity and improve broadband at the workstation. The spreadsheets also included a mechanism to calculate a library's 20 percent match (as required by the NOFA) based on their total equipment request. See Figure 56 for an example spreadsheet.

System	Branch	Work Stations*	Mobile Training**	Routers	Switches	WiFi	Other Equipment	Consulting & Evaluation
	TOTALS	0	0	0	0	0	0	

EQUIPMENT COST INFORMATION:
workstation costs: $1225.91 ea.
mobile training: $16,850 ea.
routers: $5,780 ea.
switches: $2,000 ea.
consulting & evaluation: $579.20 ea. Outlet

Equipment cost by type	$	$	$	$	$	$	$

Total grant equipment cost:	$ -
Total match required	$ -

* Workstation includes CPU, monitor, keyboard, mouse, and software.
Mobile Training Lab includes **20 laptops, charging unit, cart, projector, etc.

Figure 56. Spreadsheet for Florida Public Librarians to Report Computing Needs to State Library

In addition to the equipment options detailed in Figures 55 and 56, wireless installation and upgrades and specific LAN and server equipment were offered to libraries on as as-needed basis. Wireless costs are estimated based on small and medium public libraries, as defined above for the four facility size-based cost models. For larger libraries, wireless costs are determined on a case-by-case basis, as are individualized equipment needs such as one library with a Cisco Systems 6509 server and LAN equipment. These costs are included in the total cost estimates for Florida public library upgrades, $12,439,187.44 (Figure 57). This total does not match the total budget request for the BTOP application ($13,537,217.64) because that request included additional costs, such as staff salaries and equipment, additional consulting and evaluation costs, supplies, and travel.

EQUIPMENT & SERVICES	TOTAL QUANTITY	TOTAL COST
PAC workstation, including monitor and software	**4606**	**$5,646,516.00**
Laptop cart with 20 laptops, recharging docks, and software	**194**	**$3,268,900.00**
Routers	**172**	**$994,160.00**
Switches	**647**	**$1,294,000.00**
Wireless for small libraries	**42**	**$283,364.34**
Wireless for medium libraries	**1**	**$8,594.30**
Wireless for Jacksonville Public Library	**20**	**$232,322.45**
Wireless for Collier County Public Library	**10**	**$137,435.55**
Orlando Public Library LAN equipment	**24**	**$263,280.00**
Orlando Public Library Cisco 6509	**1**	**$131,642.00**
Consulting hours and program evaluation, per outlet participating in the BTOP program	**309**	**$178,972.80**
TOTAL COST ESTIMATE		**$12,439,187.44**

Figure 57. Total Cost Estimate for Florida Public Library Computing Upgrades

Summary of Florida Public Library Upgrade Costs

The study team, working with the State Library and a state certified vendor, tried several approaches to developing cost models for Florida public library computer upgrades. Ultimately, situational factors demanded an equipment menu, rather than a broader cost logic model, so that each library could select *only* the equipment necessary for *that* library to raise its public computing capacity. The majority of libraries selected workstations and mobile training labs, as well as some LAN equipment. A few of the larger libraries required unique services (e.g., wireless upgrades and system-wide LAN equipment), the costs of which were estimated on a case-by-case basis.

These cost estimates for upgrading Florida public library computing capacity are based on *estimates* and may vary once the libraries purchase the equipment and services beginning in 2010. For example, newer equipment models may become available for similar prices or such a large, aggregated order may further lower the individual equipment costs. Also, through the onsite consulting provided to improve the efficiency of library networks, the state certified vendor may identify additional equipment that libraries need to purchase individually to facilitate the upgrade process.

A key evaluation metric of success will be the number of workstations currently with connection speeds of less than 786 kbps down and 200 kbps up versus the number of workstations that meet or exceed these speeds *after* the upgrade. It is possible that these

upgrades, even with increased bandwidth at the front door, still may not meet the FCC requirements for broadband connectivity. Libraries still may have poorly designed and deployed networks serving too many workstations, wireless routers, and bandwidth-hogging applications to meet the FCC standard for broadband workstation speed. In such instances additional onsite assessment may be necessary to either re-configure the technology and telecommunications infrastructure or to obtain additional broadband at the front door.

Summary of Findings

This study provides only preliminary data of broadband for Florida public library outlets and K-12 public schools gathered through several methods. However, it is clear that pockets of the state experience low connectivity speeds and high connection costs, in addition to other situational factors, which affect Internet speeds and connection costs for individual public library and public school outlets. These connectivity issues affect the levels of E-government and emergency/disaster management services public libraries can provide to Florida communities.

Pockets of Low Connectivity

The findings discussed above show that public libraries, public schools, and school district offices experience varying levels of connectivity speeds around the State. These public entities have Internet connection speeds that range from less than 1 Mbps up to 1 Gbps. Rural areas tend to have slower connection speeds than urban areas, but slow connection speeds also exist in some urban areas.

For all types of entities (i.e., public libraries, public schools, and school district offices), connection speeds impact the level of services they can offer the public, and this impact is felt most in public libraries which tend to have slower connection speeds than both school district offices and individual public schools no matter their geographical location. In fact, over 75 percent of Florida public libraries report existing connection speeds are insufficient to meet patron and staff demand. Also, most of the librarians who participated in case studies were "shocked" at the drop-off in the connection speeds from the front door to individual workstations at the branches.

Pockets of High Connection Costs

Like connectivity speeds, Internet connection costs for public libraries, public schools, and school district offices vary widely across Florida. Certain counties on average pay significantly higher rates for connectivity than others. However, some schools receive free Internet connections, such as public schools in Taylor County which receive free Internet connections from the school district which owns a fiber line.

Rural counties tend to have higher prices, but urban areas also show variation among Internet connection costs. In some cases, the higher costs are related to higher connectivity speeds, but this is not always the case. This preliminary data indicates further investigation may be required to detail *why* a wide disparity of Internet connection costs occurs around the state,

but does clearly point toward a considerable assortment of costs incurred by public library outlets.

Situational Factors Affecting Broadband Internet Connectivity

A myriad of situational factors affect the Internet connection costs at each individual public library outlet, public school, and school district office. These factors include the number of simultaneous users of a shared network; the effectiveness of network switches, routers, and cabling; and switching technologies, latency effects, local settings and parameters, and the ultimate connectivity path from the door to a workstation. The possible telecommunications network configurations are endless and can significantly affect workstation speeds, depending on the configuration and efficiency of transmissions through those networks.

No matter which of these situational factors affect an individual outlet, the associated cost-related factors are large inhibitors to library outlets' ability to provide public access Internet connection. However, faster Internet alone is not a sufficient solution for public libraries. As the case studies show, they also require funding for infrastructure upgrades, additional/newer workstations, staff, and staff training. Funding for increased public library Internet connectivity must take into consideration these associated needs.

Impacts on E-Government and Emergency/Disaster Management Service Roles

The lack of high speed broadband at the workstation for some libraries significantly decreases their ability to provide E-government and emergency/disaster management services. Increased bandwidth and faster connections will improve public libraries' ability to provide information technology training; educational, job-seeking, and E-government resources and services; and wireless and wired free public Internet access.

The two proposed service levels for E-Government and emergency/disaster management offer challenging goals for Florida public libraries. Indeed, the vast majority of Florida public libraries are likely not to be qualified even for the basic level, given the limited broadband, internal network infrastructure, and staff to assist in E-government and emergency/disaster management services as outlined in the above tables. Thus, significant efforts will need to be taken to provide the necessary broadband, internal network, workstations and other production/telecommunications equipment, and technical staff.

Cost Logic Models

Developing cost logic models for library bandwidth upgrades proved to be inconsistent with the requirements in the BTOP Public Computing Center bucket, per the NTIA NOFA. Instead, the study team developed cost models to upgrade internal equipment that can facilitate faster speeds at the public access workstations, including new workstations, switches, and routers. Attempts to create categorized models that could be applied to public libraries based on population demographics and facility size failed to account for the unique situational factors each library faces. Therefore, the study team developed a menu of equipment and services from which libraries could select the most appropriate options to meet situational technology needs.

Summary of Key Findings

Well over half of Florida public libraries report connection speed insufficiency at some times, and this is more pronounced in rural and suburban public libraries. Outlets are all over the state report connection speed insufficiency and the majority of Florida public libraries report the number of public access workstations is insufficient to meet patron needs some or all of the time. Situational factors play a critical role in affecting each library's technology access and services. These factors cannot be ignored when considering how best to assist libraries improve network efficiencies and computer equipment.

Pockets or not, the current cost and speed of the Internet for Florida's public library outlets disable many librarians and libraries from adequately serving their communities. These communities turn to their public library outlets for emergency/disaster management and E-government services, as well as free and publically available broadband Internet access to participate in today's Information Society. However, slow Internet connectivity speeds, high Internet connection costs, and situational factors greatly impact libraries' ability to adequately support E-government and emergency/disaster management services.

CONCLUSION: NEED FOR INCREASED BROADBAND CONNECTIVITY, SPEEDS, AND BROADBAND SERVICES SUPPORT

Overall, the condition of Florida public libraries' access to and use of broadband requires immediate attention. This study has documented the significant need Florida public libraries have for increased broadband (both speeds and connections) and a range of other equipment and services related to the provision of broadband-enabled services from these libraries. Connection speeds at the front door vary considerably around the state, but overall most Florida public libraries are currently unable to meet existing demand and have little capacity to provide additional access to broadband services and resources. The study also found that connection speeds to the workstation can be upgraded by purchasing new workstations, routers, and switches for public libraries, as well as consulting time to assess and improve the efficiency of library networks.

Public libraries that participated in speed tests had actual connection speeds at the workstation of less than 100 kbps on a regular basis with some workstations in peak load periods in mid-afternoons with speeds of 20-50 kbps. The study documented numerous instances where basic applications did not work correctly (if at all), librarians had to ask patrons to not use some workstations so that the librarians could use certain applications, and there were regular complaints from users about the slow connection speeds and inability to use a range of applications effectively. Some of the slow speeds are also related to continued use of computer workstations that are five or more years old.

The study identified numerous reasons why the actual bandwidth at the workstation can be seriously compromised from that available at the front door. As a general statement, there are too many workstations, many of which are outdated, wireless routers, and other peripherals connected to the library network, there are not enough library networks available throughout the system, and there are too many simultaneous users of the library workstations using too many broadband-sensitive applications. Many librarians lack the knowledge and training to manage and deploy efficient networks resulting in bandwidth in the network that is basically wasted.

A major conclusion from this study, in addition to the significant need for obtaining drastically improved broadband connections and support services for Florida public libraries, is that simply providing these libraries with large upgrades in existing broadband or providing additional broadband connections to the library may not provide significant improvement of Internet connection speeds at the workstation. Many Florida public librarians will need significant technical staff in areas related to network and telecommunications management, workstation and network configuration and deployment, and broadband services planning and deployment to ensure the design and deployment of efficient connections, internal wiring and network configuration, and upgraded workstations and related equipment.

The impact of these findings and conclusions on Florida public librarians and residents is of significant concern. As Florida libraries try to recover from the vote to cut property taxes, the housing collapse, and the existing recession, residents are significantly handicapped by not being able to access and use effectively a range of broadband-enabled services and resources at the local public library. In terms of completing online job applications, interacting electronically

with local, state, and federal E-government tasks, and collaborating effectively with local and state emergency/disaster management officials, Florida residents are disadvantaged in their access to quality broadband-enabled services and resources available through their public libraries. Immediate attention should be given to remedy these issues.

ACKNOWLEDGEMENTS

The Information Institute gratefully appreciates the assistance received from the State Library and Archives of Florida, especially Mark Flynn, and all librarians who participated in case studies. In addition, the Institute thanks Melinda Crowley and Maureen Githens at the Florida Department of Education for their assistance and support.

BIBLIOGRAPHY

American Library Association. (2008). *Opening the "window to a larger world": Libraries' role in changing America: report to President-Elect Obama and Vice-President-Elect Biden transition team*. Chicago: American Library Association. Retrieved April 21, 2009, from http://www.ala.org/ala/aboutala/offices/wo/ALA%20Report%20To%20Transi.pdf

American Library Association, & Information Use Management & Policy Institute. (2009). *Public library funding and technology access survey*. Chicago: American Library Association.

American Library Association Office for Research and Statistics. (2009a). *Libraries connect communities: Public Library Funding & Technology Access Study 2008-2009* [Electronic resource]. Chicago: American Library Association. http://www.ala.org/ala/aboutala/offices/ors/plftas/0809report.cfm

American Library Association Office for Research and Statistics. (2009b). *U. S. public libraries and E-government services*. Chicago: American Library Association. Retrieved June 19, 2009, from http://www.ala.org/ala/aboutala/offices/ors/plftas/IssuesBrief-Egov.pdf

American Library Association Office for Research and Statistics, American Library Association Office for Information Technology and Policy, & Information Use Management & Policy Institute. (2008). *Internet connectivity in U.S. public libraries*. Chicago: American Library Association. Retrieved April 21, 2009, from http://www.ala.org/ala/aboutala/offices/ors/plftas/connectivitybrief.pdf

Benton, C., Rintels, J., & Hudson, H. E. (2009). *Comments of the Benton Foundation, Center for Creative Voices in the Media and Professor Heather E. Hudson before the Federal Communications Commission in the matter of a national broadband plan for our future*. Washington, D.C.: Benton Foundation. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220162

Bertot, J. C., Jaeger, P. T., Langa, L. A., & McClure, C. R. (2006). Public access computing and Internet access in public libraries: the role of public libraries in e-government and emergency situations. *First Monday*, *11*(9), n.p. Retrieved April 21, 2009, from http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1392/1310

Bertot, J. C., Jaeger, P. T., & McClure, C. R. (2008). Citizen-centered E-government services: Benefits, costs, and research needs. In S. A. Chun, M. Janssen, & J. R. Gil-Garcia (Eds.), *Proceedings of the 9th Annual International Digital Government Research Conference* (pp. 137-141). Digital Government Society of North America. Retrieved June 15, 2009, from http://delivery.acm.org/10.1145/1370000/1367858/p137-bertot.pdf?key1=1367858&key2=8285535421&coll=GUIDE&dl=GUIDE&CFID=40200149&CFTOKEN=64478100

Bertot, J. C., & McClure, C. R. (2007). Assessing sufficiency and quality of bandwidth for public libraries. *Information Technology and Libraries, 26*(1), 14-22.

Bertot, J. C., McClure, C. R., Wright, C. B., Jensen, E., & Thomas, S. (2008). *Public libraries and the Internet 2008: Study results and findings*. Tallahassee, FL: Florida State University, College of Information, Information Use Management & Policy Institute. Retrieved April 21, 2009, from http://www.ii.fsu.edu/plinternet_reports.cfm

Boyd, P., & Berejka, M. (2009). *Consolidated comments of Microsoft Corporation before the Department of Commerce, National Telecommunications and Information Administration, Department of Agriculture, Rural Utilities Service, and the Federal Communications Commission in the matter of American Recovery and Reinvestment Act of 2009 broadband initiatives, the Commission's consultative role in the broadband provisions of the Recovery Act*. Redmond, WA: Microsoft Corporation. Retrieved April 24, 2009, from http://www.ntia.doc.gov/broadbandgrants/comments/78A.pdf

Byrd, B. R., Charytan, L. R., & Zachary, H. M. (2009). *Comments of AT&T Inc*. Washington, D.C.: AT&T Inc. Retrieved April 15, 2009, from http://www.ntia.doc.gov/broadbandgrants/comments/7B31.pdf

Charytan, L. R., Zachary, H. M., DeVries, W. T., Sherwood, A. H., Zinman, J. S., Phillips, G. L., et al. (2009). *Comments of AT&T Inc. before the Federal Communications Commission in the matter of a national broadband plan for our future*. Washington, D.C.: AT&T. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220047

Communication Workers of America, American Library Association, & Speed Matters. (n.d.). *High speed Internet: And libraries*. Washington, D.C.: Communication Workers of America. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220215

Corporation for Education Network Initiatives in California. (2005). *On the road to a gigabit broadband: Are we there yet? A self-assessment guide for communities*. Cypress, CA: Corporation for Education Network Initiatives in California. Retrieved May 13, 2009, from http://www.cenic.com/guide/pdfs/guide.pdf

Daniels, H. (2009, June 16). New center helps families: Neighborhood facility offers library, program for children. *Gainesville Sun* [Electronic version]. Retrieved June 22, 2009, from http://www.gainesville.com/article/20090616/articles/906161013

Education and Libraries Networks Coalition. (2009). *Comments of the Education and Libraries Networks Coalition to the Federal Communications Commission in the matter of a national broadband plan for our future*. Education and Libraries Networks Coalition. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520219921

Enterprise Florida. (2009). *Rural areas* [Electronic resource]. Orlando, FL: Enterprise Florida. Retrieved May 20, 2009, from http://www.eflorida.com/floridasregionsSubpage.aspx?id=400

Florida Office of Economic and Demographic Research. (2009). *EDR population page* [Electronic resource]. Tallahassee, FL: Florida Office of Economic and Demographic Research. Retrieved May 20, 2009, from http://edr.state.fl.us/population.htm

Florida Office of Economic Recovery. (2009). *Comments for the National Telecommunication and Information Administration (NTIA) and Rural Utilities Service (RUS) regarding broadband provisions of the American Recover and Reinvestment Act of 2009*. Tallahassee, FL: Florida Office of Economic Recovery. Retrieved April 15, 2009, from http://www.ntia.doc.gov/broadbandgrants/comment.cfm?e=23CA9B65-AE22-4E2C-9489-12896694823B

Free Press. (2009). *Wired less: Disconnected in urban America*. Washington, D.C.: Free Press. Retrieved June 15, 2009, from http://www.freepress.net/files/Wired_Less_Disconnected_in_Urban_America.pdf

Gibson, A. N., Bertot, J. C., & McClure, C. R. (2009). Emerging role of public librarians as e-government providers. In R. H. Sprague, Jr., *Proceedings of the 42nd Hawaii International Conference on System Sciences* [Electronic version] (pp. 1-10). Los Alamitos, CA: IEEE Computer Society. Retrieved June 22, 2009, from http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4755562&isnumber=4755314

Gibson, A. N., Bertot, J. C., McClure, C. R., Mandel, L., & Snead, J. T. (2008). *Florida public libraries and E-government: Services, issues, and recommendations*. Information Use Management & Policy Institute, College of Information, Florida State University. Retrieved June 15, 2009, from http://www.ii.fsu.edu/documents/reports/FL_Egov_2008Report.pdf

Goldman, D. (2009a). *Comments of Communication Workers of America before the Federal Communications Commission in the matter of a national broadband plan for our future*. Washington, D.C.: Communication Workers of America. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220214

Goldman, D. (2009b). *Comments of the Communication Workers of America before the U.S. Department of Commerce, National Telecommunications and Information Administration and the U.S. Department of Agriculture, Rural Utilities Service in the matter of American Recovery and Reinvestment Act of 2009 broadband initiatives*. Washington, D.C.: Communication Workers of America. Retrieved April 15, 2009, from http://www.ntia.doc.gov/broadbandgrants/comments/7B44.pdf

Golston, A. (2009). *Comments of the Bill & Melinda Gates Foundation before the United States Department of Commerce National Telecommunications and Information Administration in the matter of implementation of the Broadband Technology Opportunities Program*.

Seattle, WA: Bill & Melinda Gates Foundation. Retrieved April 15, from http://www.ntia.doc.gov/broadbandgrants/comments/7358.pdf

Gupta, A., Berejka, M., Griffin, T., & Boyd, P. (2009). *Comments of Microsoft Corporation before the Federal Communications Commission in the matter of a national broadband plan for our future*. Redmond, WA: Microsoft. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220228

Horrigan, J. B. (2008). *Home broadband adoption 2008: Adoption stalls for low-income Americans even as many broadband users opt for premium services that give them more speed*. Washington, D.C.: Pew Internet and American Life Project. Retrieved May 11, 2009, from http://www.pewinternet.org/~/media//Files/Reports/2008/PIP_Broadband_2008.pdf

Hudson, H. E. (2007). *The future of Universal Service Fund support for organizations: Schools, libraries and rural health care providers*. San Francisco, CA: Communications Technology Management Program, University of San Francisco. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220174

Jaeger, P. T., Langa, L. A., McClure, C. R., & Bertot, J. C. (2007). The 2004 and 2005 Gulf Coast hurricanes: Evolving roles and lessons learned for public libraries. *Public Library Quarterly, 25*, 199-214.

Kranich, N. (2006). *Libraries as universal service providers*. Washington, D.C.: Benton Foundation. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220175

Kundra, V. (2009, June 8). Data transparency via Data.gov. *The Briefing Room* [Blog]. Washington, D.C.: White House. Retrieved June 22, 2009, from http://www.whitehouse.gov/blog/Discussion-Phase-Transparency-Data/

Livingston, S. (2009, June 26). Budget cuts mean shorter hours for Branford library. *Suwanee Democrat* [Electronic version]. Retrieved June 30, 2009, from http://www.suwanneedemocrat.com/archivesearch/local_story_176172912.html

Luker, M. (2009). *Comments re: request for information on section 6001 of the American Recovery and Reinvestment Act of 2009 broadband initiatives (docket no. 090309298-9299-01)*. Washington, D.C.: EDUCAUSE. Retrieved April 15, 2009, from http://www.ntia.doc.gov/broadbandgrants/comments/7966.13.2009.pdf

McClure, C. R. (2008). *Public libraries and the Internet, 1997-2008* [Electronic resource]. Tallahassee, FL: Information Use Management & Policy Institute, College of Communication & Information, Florida State University. Retrieved June 15, 2009, from http://www.ii.fsu.edu/plinternet_reports.cfm

McClure, C. R., & Jaeger, P. T. (2009). *Public libraries and Internet service roles: Measuring and maximizing Internet services*. Chicago: American Library Association.

McClure, C. R., McGilvray, J., Barton, K. M., & Bertot, J. C. (2007). E-Government and public libraries: Current status, meeting report, findings, and next steps. Tallahassee, FL: Information Use Management & Policy Institute, College of Information, Florida State University. Retrieved June 15, 2009, from http://www.ii.fsu.edu/announcements/e-gov2006/egov_report.pdf

McClure, C. R., Ryan, J., Mandel, L. H., Brobst, J., Hinnant, C. C., Andrade, J., et al. (2009). Hurricane preparedness and response for Florida public libraries: best practices and strategies. *Florida Libraries, 52*(1), 4-7.

McClure, C. R., Ryan, J., Mandel, L. H., Brobst, J., Hinnant, C. C., & Snead, J. T. (in press). Public libraries in hurricane preparedness and response. In *Public Libraries and the Internet: Roles, Perspectives, and Implications*.

National Telecommunications and Information Administration. (2004). *A nation online: Entering the broadband age*. Washington, D.C.: U.S. Department of Commerce. Retrieved April 10, 2009, from http://www.ntia.doc.gov/reports/anol/nationonlinebroadband04.pdf

Oblinger, D. Van Houweling, D., & Semer, J. (2009). *Comments by EDUCAUSE, Internet2 and ACUTA before the Federal Communications Commission in the matter of a national broadband plan for our future*. Washington, D.C.: EDUCAUSE. Retrieved June 15, 2009, from http://net.educause.edu/ir/library/pdf/EPO0917.pdf

Pastore, E., & Henderson, E. (2009). *Date note: libraries use broadband Internet service to serve high need communities*. Washington, D.C.: Institute of Museum and Library Services. Retrieved April 21, 2009, from http://www.imls.gov/pdf/DataNote2009-01.pdf

Sheketoff, E. (2009a). *Comments of the American Library Association before the Federal Communications Commission in the matter of a national broadband plan for our future*. Washington, D.C.: American Library Association Washington Office. Retrieved June 10, 2009, from http://www.wo.ala.org/districtdispatch/wp-content/uploads/2009/06/alanoi6-8.pdf

Sheketoff, E. (2009b). *Submission of the American Library Association to the U.S. Department of Commerce National Telecommunications and Information Administration and the U.S. Department of Agriculture Rural Utilities Service: comments regarding docket no. 090309298-9299-01 American Recovery and Reinvestment Act of 2009 broadband initiatives April 13, 2009*. Washington, D.C.: American Library Association Washington Office. Retrieved April 15, 2009, from http://www.ntia.doc.gov/broadbandgrants/comments/7AA6.pdf

Telecommunications Act of 1996. (1996). 110 Stat. 56 § 706. Retrieved June 15, 2009, from http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=104_cong_bills&docid=f:s652enr.txt.pdf

Turner, S. D. (2009). *Dismantling digital deregulation: Toward a national broadband strategy*. Washington, D.C.: Free Press. Retrieved May 13, 2009, from http://www.freepress.net/files/Dismantling_Digital_Deregulation.pdf

U. S. Census Bureau. (n.d.). *American FactFinder help – glossary* [Electronic resource]. Washington, D.C.: U. S. Census Bureau. Retrieved April 29, 2009, from http://factfinder.census.gov/home/en/epss/glossary_a.html

U.S. Department of Agriculture Economic Research Service. (2007). *Rural definitions: Data documentation and methods* [Electronic resource]. Washington, D.C.: U.S. Department of Agriculture. Retrieved April 30, 2009, from http://www.ers.usda.gov/Data/RuralDefinitions/documentation.htm

Whitt, R. S., & Lampert, D. N. (2009). *Comments of Google Inc. before the Federal Communications Commission in the matter of a national broadband plan for our future*. Washington, D.C.: Google. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520220241

Windhausen, J., Jr. (2008). *A blueprint for big broadband: An EDUCAUSE white paper*. Washington, D.C.: EDUCAUSE. Retrieved April 21, 2009, from http://net.educause.edu/ir/library/pdf/EPO0801.pdf

Wyman, S. (2009, June 16). Commission vows no tax rate hike. *The Sun-Sentinel: Broward Politics Blog*. Retrieved June 30, 2009, from http://weblogs.sun-sentinel.com/news/politics/broward/blog/2009/06/commission_vows_no_tax_rate_hi.html

Zachem, K. A., Don, D. M., McManus, M. P., & Waz, J. W., Jr. (2009). *Comments of Comcast Corporation before the Federal Communications Commission in the matter of a national broadband plan for our future*. Washington, D.C.: Comcast Corporation. Retrieved June 15, 2009, from http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native-or-pdf=pdf&id=6520219851

APPENDIX

Appendix A: Project Task Activities

The following describes basic activities for key tasks that the Information Institute carried out for the State Library and Archives of Florida as part of this E-government initiative during the 10 week period between April 28, and June 15, 2009.

Task 1: Describe Existing Broadband Connectivity Speeds of Florida Public Library Outlets

The Institute collected feedback on existing broadband connectivity speeds in selected Florida public library outlets. Basic activities for this activity included:

- Conducted case studies (i.e. public libraries conduct the research) that describe current broadband configuration/infrastructure, collected data on work station connectivity speeds and network configurations, and collected anecdotal data related to use of the work stations at the current connectivity speeds;
- Conducted site visits (i.e. by research team members) to selected public libraries to review and test work station connectivity speeds and network configurations;
- Accessed the Bill & Melinda Gates Foundation Florida public library technology dataset (2009) and used GIS software to manage, analyze, and display current Florida public library broadband information geographically; and
- Analyzed results of the Public Library Funding and Technology Access Survey (American Library Association and Information Institute, 2009) related to technology and broadband use and deployment. Researchers also reviewed other public library datasets such as those available from the National Center for Educational Statistics and the Universal Service Administrative Company.

Results of analysis of existing broadband connectivity speeds and network configurations provided data on existing levels of Internet service, costs of existing services, and potential to increase/improve Internet connectivity.

Task 2: Describe Possible E-Government and Emergency/Disaster Management Service Roles Associated with Various Broadband Speeds

The Institute developed and obtained feedback on a number of E-government and emergency/disaster management service roles. Three levels of public library service roles were developed: basic level of effort, moderate level of effort, and extensive level of effort. The last two roles build on the basic and the third builds on the moderate level. For example, moderate level service roles include basic levels but also include additional roles. Extensive includes moderate level of effort service roles and additional service roles. The more extensive the service roles the more broadband connectivity required to provide these service roles. Basic activities completed in this task include:

- Review previous work conducted by the Information Institute and others regarding E-government and emergency/disaster management service roles;[10]
- Conduct targeted interviews and possibly some focus groups with public librarians and emergency management officials to define levels of service roles;
- Produce draft E-government and emergency/disaster management service roles;
- Test and validate the service roles with key informants;
- Refine and finalize these service roles;
- Estimate the costs (broadband connectivity, staff, related technology equipment, and other resources) for a library to offer each of the three levels of E-government and emergency/disaster management service; and
- Interview selected public librarians and others to estimate capacity and willingness to serve in these E-government and emergency/disaster management service roles.

These tasks identified existing and potential public library E-government and emergency/disaster management service roles and provide an estimate of librarians' willingness to serve in these roles.

Task 3: Estimate the Costs Associated with Upgrading Public Library Equipment and Improving Connection Speeds

Based on tasks 1 and 2 above, researchers estimated the costs associated with upgrading public library equipment to better manage network efficiency and improve at-the-workstation connection speeds. Basic activities in this task included:

- Review described existing broadband connectivity speeds collected from Florida public library outlets (i.e. task 1 above);
- Develop and explain broadband connectivity costs logic model;
- Provide public library location, current connectivity speeds, and current annual cost to AT&T and requested broadband upgrade costs and connection speeds for all 547 Florida public library outlets;
- Develop equipment upgrades cost models, working with the State Library and a State of Florida Certified Vendor; and
- Estimate the total costs for upgrading equipment in all Florida public libraries interested in participating in the State Library's statewide BTOP grant application.

These tasks will identify costs associated with current and future potential broadband connectivity.

Task 4: Identify and Describe Public Library Broadband and E-government and Emergency/ Disaster Management Service Needs in Underserved, Unserved, and Rural Populations

The Information Institute made a preliminary assessment of the range and nature of broadband and E-government and emergency/disaster management service needs of public

[10] Possible EGEDM service roles can be modeled from McClure, C. R., & Jaeger, P. T. (2009). *Public libraries and Internet service roles: Measuring and maximizing Internet services*. Chicago: American Library Association.

libraries statewide and especially in areas that serve under-served, unserved, and rural populations.[11] The needs assessment was used to propose priorities for areas that may most need increased broadband connectivity and better services. Key activities within this task included:

- Review approaches to define under-served, unserved, and rural populations in the state of Florida;
- Analyze datasets from the Information Institute, IMLS, NCES, and USAC to identify under-served, unserved, and rural populations and the libraries that serve them;
- Identify the public libraries that serve the under-served, unserved, and rural populations in the state of Florida by LATA, county, and census tract;
- Obtain review and feedback on this preliminary list/map from public librarians and other key informants; and
- Produce a final list/map categorizing broadband and E-government and emergency/disaster management service needs of public libraries in terms of moderate, significant, and extensive needs.

This task resulted a set of maps that describe geographic areas in the state depicting public library broadband and E-government and emergency/disaster management service needs within LATAs and/or county.

Task 5: Produce Final Report

The Information Institute developed this final report for the State Library and Archives of Florida. It describes project activities, findings, recommendations, and conclusions. The key activities required to complete the final report were:

- Describe the project activities and methodology;
- Describe the E-government and emergency/disaster management service roles, the cost of providing these service roles, the capacity of Florida public libraries that would provide these service roles, and the likely willingness to offer these services;
- Describe the geographic areas in the state depicting public library broadband and E-government and emergency/disaster management service needs within LATAs and/or county;
- Offer an assessment of statewide needs for additional public library broadband connectivity (and related technology infrastructure needs) to support E-government and emergency/disaster management service; and
- Offer recommendations for how Florida public libraries can better provide broadband-based E-government and emergency/disaster management services.

Given the short duration of this project, the needs assessment is considered to be a preliminary assessment that offers an initial set of findings and recommendations regarding public library broadband and E-government and emergency/disaster management needs – especially for under-served, non-served, and rural populations.

[11] It is important to recognize that under-served and non-served may be located in urban areas. See, for example Wired Less: Disconnected in Urban America (2009), http://www.freepress.net/node/55854.

Appendix B: Project Methodology and Data Collection

Methodology

The needs assessment employs a multi-method data collection approach. Data collection approaches used in this study include:

- *Literature review* – Research team members conducted a literature review of public library technology and broadband use and deployment;
- *Interviews* – Research team members conducted interviews with selected public librarians, emergency management officials, and others knowledgeable about the topic to understand the existing broadband connections and configurations in Florida public libraries, define levels of service roles (i.e., basic, moderate, and extensive), to test and validate the service roles and to estimate capacity and willingness to serve in these E-government and emergency/disaster management service roles, and to obtain review and feedback related to the use and usefulness of developed maps that indicate underserved and unserved populations by LATA, county, and census tracts;
- *Public library case studies* – Selected public libraries conducted case studies describing their current broadband configuration/infrastructure and collected data on their work station connectivity speeds and network configurations;
- *Public library site visits* – Research team members reviewed and tested public library work station connectivity speeds and public library network configurations;
- *Geographic Information System* (GIS) *Analysis of Public Library Telecommunications* – Research members accessed the Bill & Melinda Gates Foundation Florida public library technology dataset (2009) and used GIS software to manage, analyze, and display Florida public library broadband information geographically; and
- *Public library national survey data analysis* – Analysis of the *Public Library Funding and Technology Access Survey* (American Library Association and Information Institute, 2009) related to technology and broadband use and deployment. Other datasets reviewed included those available from the National Center for Educational Statistics and the Universal Service Administrative Company.
- *Connectivity Costing Models* – Research team members investigated several possible models by which to cost out library equipment and bandwidth upgrades, ultimately settling on a menu of equipment options so that libraries could select the equipment and services that best meet their situational technology needs.

The data collection methods used in this study provided data used to inform project goals and tasks.

Sampling Strategy and Data Quality

The study team employed a combination of purposeful and cluster sampling for the study's iterative multi-method data collection efforts. The study was exploratory and purposeful, thus limiting the generalization of the data. The six methodologies, however, provided detailed and overlapping findings regarding broadband capacity issues associated with providing E-

Government and emergency/disaster management services and resources in public libraries. By using an iterative and multi-method approach, the study team identified and triangulated perspectives on broadband needs for the delivery of E-Government and emergency/disaster management services and resources in public libraries from both the public library and user populations, thus ensuring reliable and valid data.

Needs Assessment

Literature Review

The literature review provided background information related to broadband deployment to meet underserved and unserved populations. It addressed issues such as:

- Defining broadband;
- Understanding basic and complex network configurations and impacts of different configurations on speed at the workstation;
- Understanding different approaches for determining and defining rurality in Florida; and
- Importance of situational factors and variables affecting broadband upgrades at the local library level.

Overall, the literature review provided background information capable of describing the importance and need for increased and improved public library broadband availability and implementation in terms of meeting the needs of underserved and unserved populations.

Interviews

Research team members conducted interviews with selected public librarians, emergency management officials, and others knowledgeable about the topic to understand the existing broadband connections and configurations in Florida public libraries, define levels of service roles (i.e., basic, moderate, and extensive), to test and validate the service roles and to estimate capacity and willingness to serve in these E-government and emergency/disaster management service roles, and to obtain review and feedback related to the use and usefulness of developed maps that indicate underserved and unserved populations by LATA, county, and census tracts. The study population for interviews consists of Florida public librarians and emergency management officials who can:

- Understand existing broadband connections and configurations in Florida public libraries;
- Identify and define existing and potential public library E-Government and emergency/disaster service roles (i.e. basic, moderate, and extensive);
- Validate the service roles;
- Estimate capacity and willingness of public librarians to serve in these E-government and emergency/disaster management service role; and
- Obtain review and feedback related to the use and usefulness of developed maps that indicate underserved and unserved populations by LATA, county, and census tracts.

Selected study participants from the population above included those who provided informed feedback related to identified E-Government and emergency/disaster service roles and on the use of developed GIS maps and public library database generated tables/graphs that identify public library broadband needs and issues for advocacy purposes.

Public Library Broadband Connectivity Data Collection: Case Studies and Site Visits

The study team enlisted six public libraries to conduct broadband connectivity case studies in their libraries. In addition, the study team collected other broadband connectivity data through site visits to selected libraries. Case studies and site visits provide data specific to broadband connectivity in public libraries. Activities to collect the data included:

- Collecting current public library broadband connectivity network configuration/infrastructure data, such as connectivity speed coming into a site, connectivity speed at work stations throughout a test site, and changes in work station speed at different times on different days of the week;
- Collecting anecdotal data related to current connectivity speed and based on library situational factors such as location of work stations and use/time of day connectivity; and
- Identifying existing and potential future broadband connectivity needs and issues.

Case studies and site visits provided technical and anecdotal data on current broadband use in libraries and provided a basis for determining potential issues with current availability of broadband and connectivity improvement needs

Data collection efforts for the case studies were based on library-provided answers to the following requests:

1. Provide us with a written network configuration for your library network beginning with the bandwidth coming in to the system (library), how all the branches and outlets are connected, with what, and at what speed.
2. Tell us your telecommunications/broadband costs for the current network and name of the ISP.
3. Do some speed tests at the workstation level using www.speakeasy.com (or whatever you prefer) over a one week time period at a selection of the branches, preferably around (9:00 AM and 4:00 PM in the afternoon) on weekdays – MWF would be great.
4. Supply us with anecdotes or stories regarding connectivity and bandwidth at the branch level as to problems or issues.
5. Describe the internal size of the library technical staff and the amount/type of assistance you get from the ISP.
6. Draw the DREAM configuration that you wish you had for your broadband connection (based on number one above) and indicate what the costs would be with your current provider.
7. Send all this material to Chuck McClure; we will then schedule a quick conference call to discuss.

Typically, a member of the research team contacted either the library director or lead technical support person at the case study site and asked if they would be willing to provide answers to the above seven questions. An attempt was made to obtain data from two large library settings, two moderate sized libraries and two smaller and rural libraries. The libraries provided answers to the above seven questions as best they could. In a number of instances a member of the study team either through email or via phone conversations assisted them to locate/obtain the information.

The site visits to libraries included:

- Descriptions of network configurations at the library;
- Identification and description of impacts of different network configurations on speed at the workstation;
- Description of situational factors and variables, such as broadband loads at different times of a day and/or days of the week and how these varying loads affect workstation speed; and
- Provision of insights on the library's decision-making process related to planned or needed broadband upgrades at the local library level and issues that affect upgrades, such as available resources, IT services, and others.

Findings from case studies and site visits provide data useful in describing public library broadband availability and deployment needs and issues.

Geographic Information Systems (GIS) Broadband Data Analysis

GIS applications provided maps that describe and display public library broadband demographic information geographically where geographically displayed data identifies patterns, trends, and relationships across Florida public library outlets. Demographics include location, broadband connectivity speed and costs by county and by LATA for all Florida public library outlets. In addition, demographics include location, broadband connectivity speed and cost for Florida public libraries located in the 28 RACEC counties. Broadband costs include: connections; internal library upgrades to IT infrastructure; new workstations, printers, etc.; and staff for planning services and IT management.

Public Library National Survey Data Analysis

Public library national survey datasets provided data related to technology and broadband use and deployment from national survey datasets such as the annual data collected by the Information Institute over the past five years for the Bill and Melinda Gates Foundation. Other datasets used include those available from the National Center for Educational Statistics and the Universal Service Administrative Company. Data analyzed includes available broadband, sufficiency of available broadband, monthly (or other) connectivity fees, number of workstations, etc.

Connectivity Costing Models

Research team members provided public library location, current connectivity speeds, and current annual cost to AT&T and requested broadband upgrade costs and connection speeds for all 547 Florida public library outlets. Data collected from site visits, case studies, GIS maps, public library national survey data, and AT&T upgrade costs allowed research team members to develop a number of initial connectivity cost logic models. This method would have resulted in the cost logic model, a total cost for upgrades in all Florida public libraries, and a total cost for upgrading only the libraries in the 28 RACEC counties. However, based on the NTIA Notice of Funding Availability (NOFA) and with input from the State Library, the study team abandoned the plan for cost models to upgrade library bandwidth

Ultimately, the study team, working in concert with the State Library, developed a menu of equipment options from which libraries selected what they needed, and tabulated a total cost of all necessary upgrade equipment for libraries participating in the State Library's BTOP grant program.

Audience

The study team conducted the needs assessment and wrote the final report in an effort to provide language the State Library can use to apply for a BTOP public computer center capacity grant. In addition, the lessons learned from this statewide needs assessment of public library broadband access can be applied to libraries across the U.S. The study team intends to disseminate findings from the needs assessment to share what was learned regarding broadband access in public libraries as well as the process of conducting a statewide public library technology needs assessment.

Appendix C: Definitions of "Rural"

Definition	Applicable Counties
***Rural Economic Development Initiative*:** county with a population less than or equal to 75,000 persons[12]	Baker, Bradford, Calhoun, Columbia, De Soto, Dixie, Franklin, Gadsden, Gilchrist, Glades, Gulf, Hamilton, Hardee, Hendry, Holmes, Jackson, Jefferson, Lafayette, Levy, Liberty, Madison, Nassau, Okeechobee, Putnam, Suwannee, Taylor, Union, Wakulla, Walton, and Washington[13]
***Rural Economic Development Initiative*:** county with a population less than or equal to 100,000 persons that is geographically adjacent (i.e., contiguous) to a county with a population less than or equal to 75,000 persons[14]	Flagler[15]
***Rural Health Networks*:** any area with fewer than 100 persons per square mile or any area defined as rural by the most recent U.S. Census [16]	Baker, Bradford, Calhoun, Columbia, De Soto, Dixie, Franklin, Gadsden, Gilchrist, Glades, Gulf, Hamilton, Hardee, Hendry, Highlands, Holmes, Jackson, Jefferson, Lafayette, Levy, Liberty, Madison, Monroe, Nassau, Okeechobee, Putnam, Sumter, Suwannee, Taylor, Union, Wakulla, Walton, and Washington[17]

Figure 2. Florida Rural Counties According to Rural Economic Development Initiative and Rural Health Network Definitions.

[12] 19 *Florida Statutes* § 288.0656 (2) (a)
[13] 2008 population estimates from Florida Office of Economic and Demographic Research, 2009
[14] 19 *Florida Statutes* § 288.0656 (2) (a)
[15] 2008 population estimates from Florida Office of Economic and Demographic Research, 2009
[16] 29 *Florida Statutes* § 381.0406 (2) (a)
[17] 2005 Census population estimate-based list:
http://www.doh.state.fl.us/workforce/RuralHealth/PDFs/ruralcounties.pdf

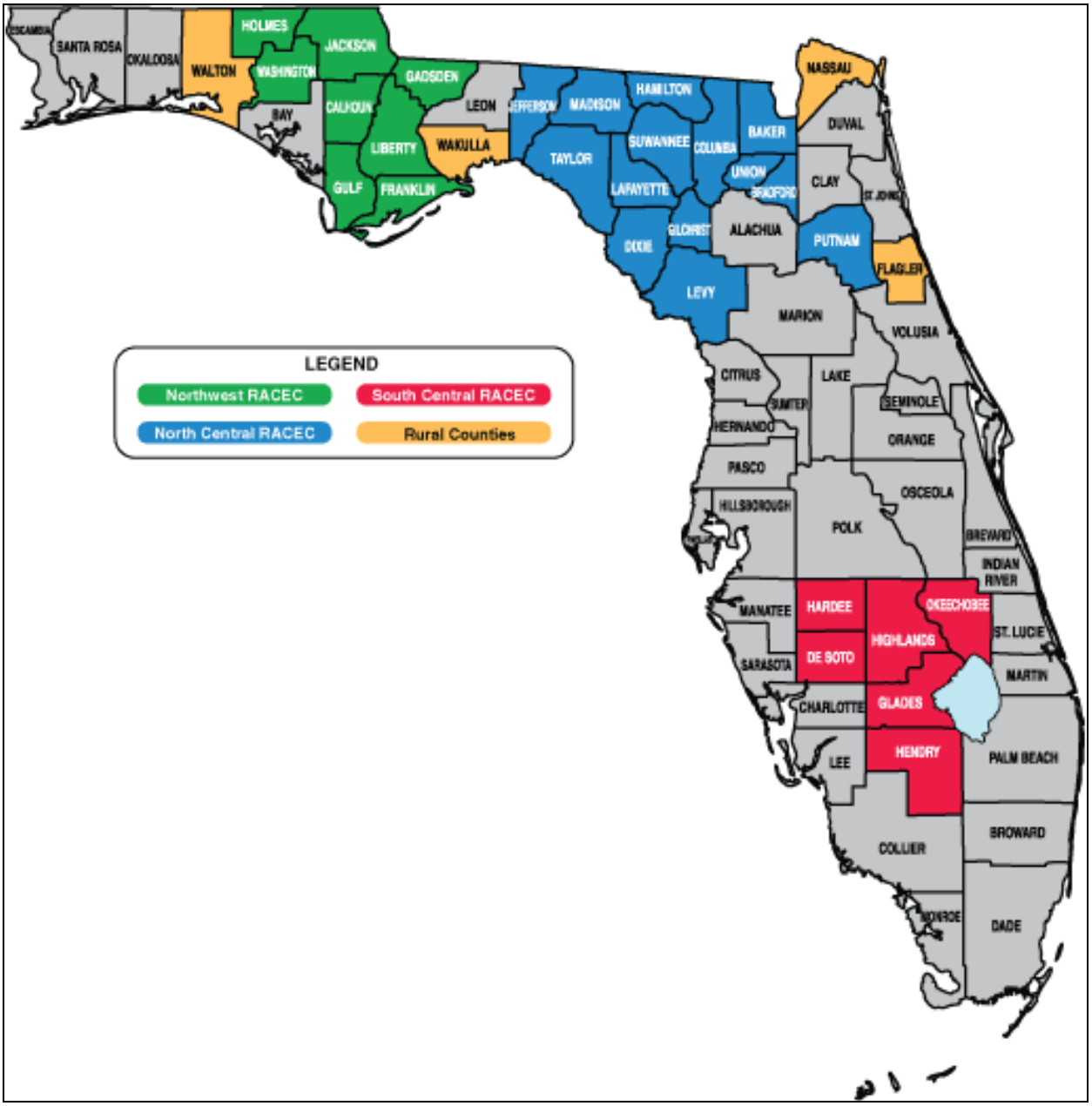

Figure 3. Florida's Rural Counties by RACEC from Enterprise Florida.

Appendix D: PLFTAS and ALA Survey Data Figures

Connectivity Issues

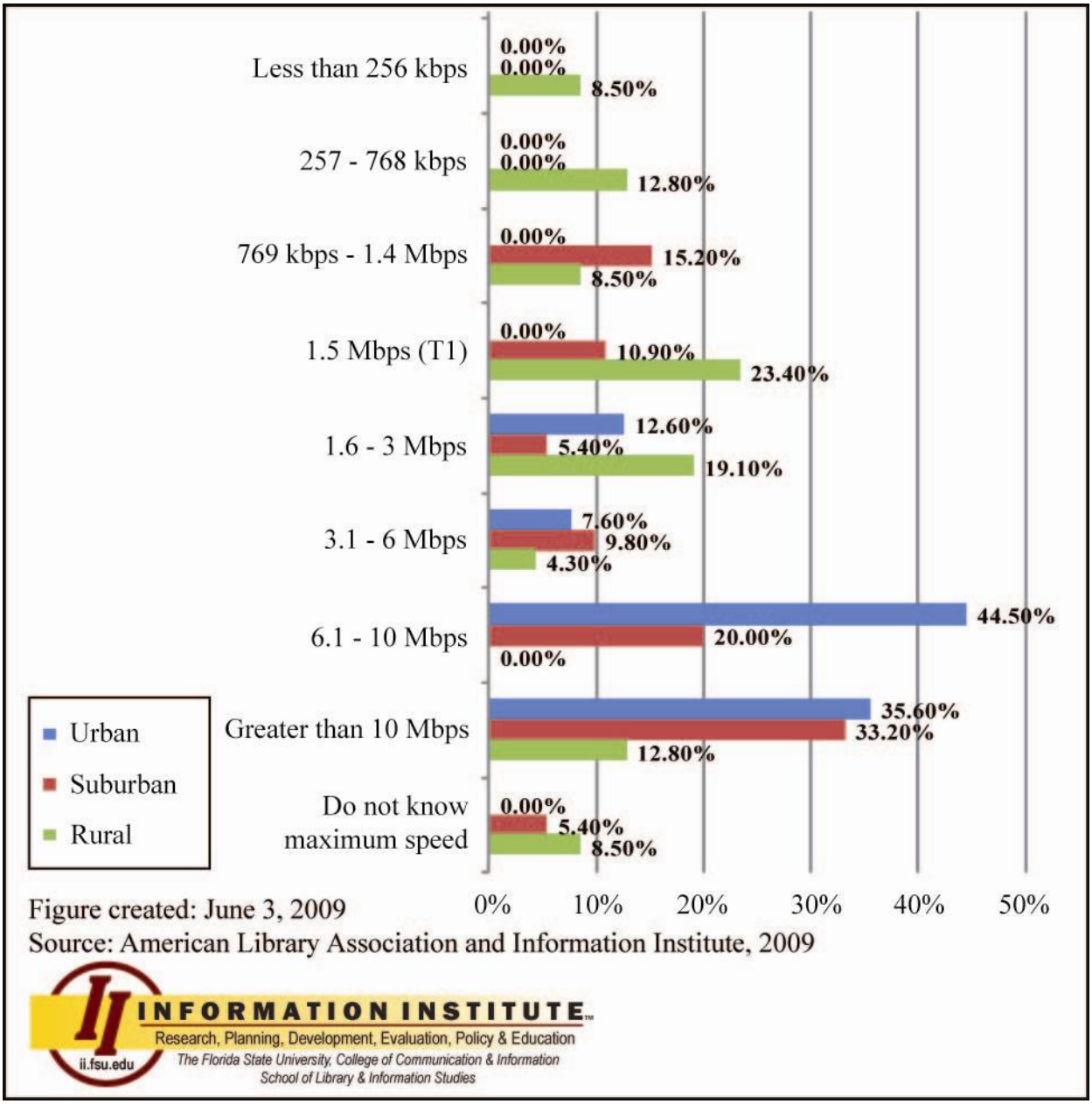

Figure 4. Public Library Outlet Maximum Speed of Public Internet Access Services by MSA: Florida 2009

Internet Services

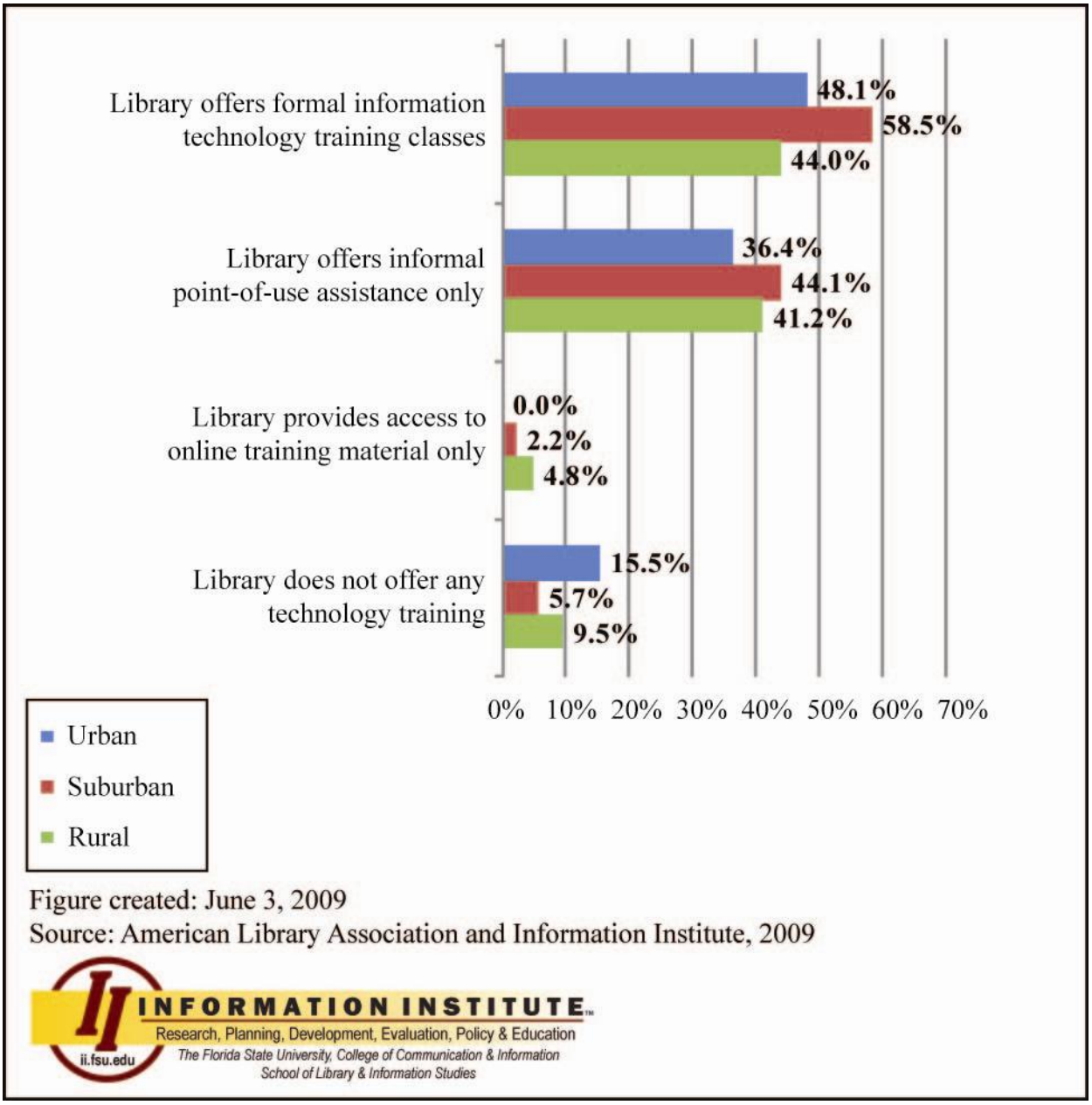

Figure 8. Formal or Informal Information Technology Training Classes Offered by MSA: Florida 2009

Figure 9. Formal Technology-Based Training Classes Offered: Florida 2009

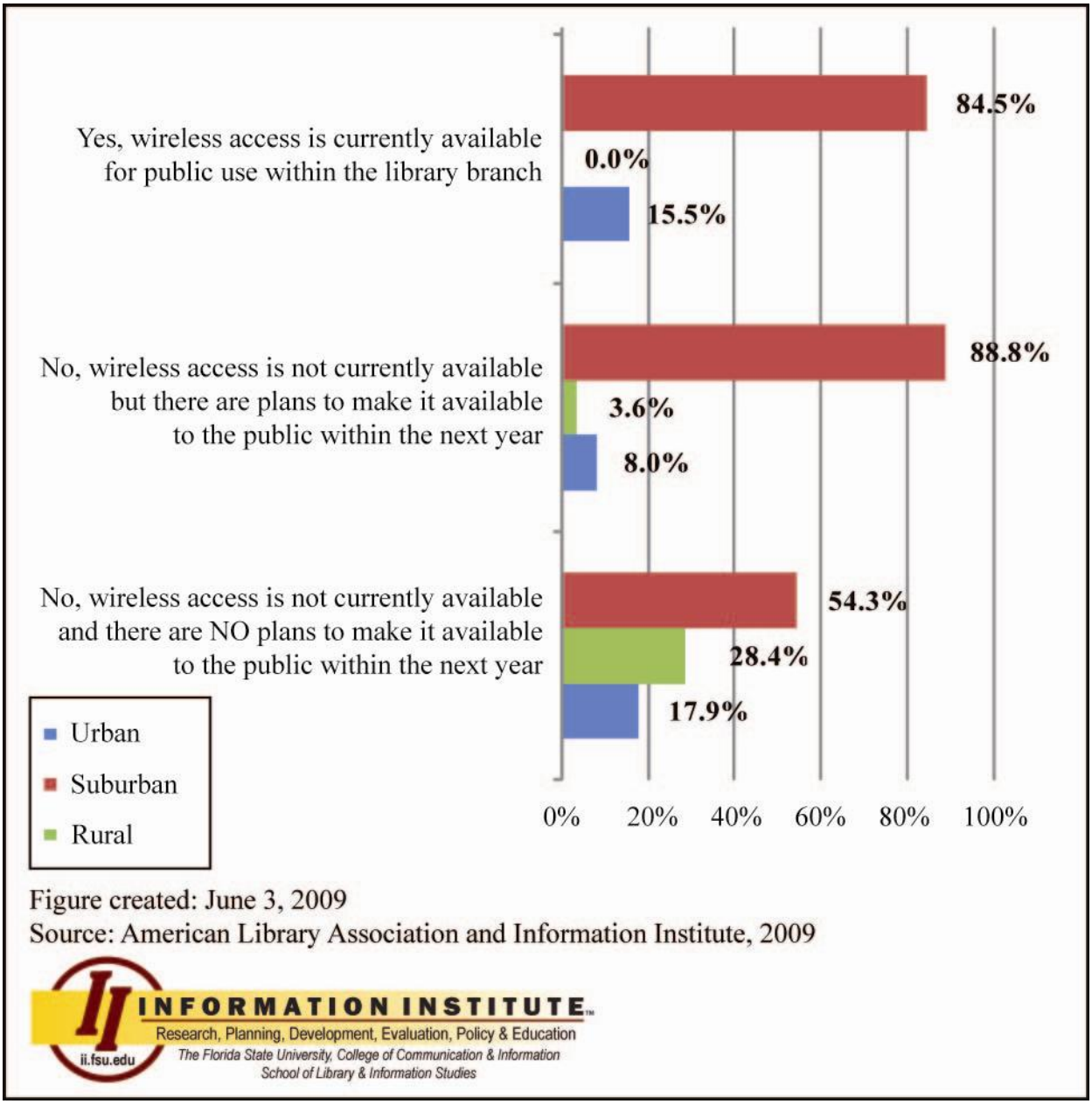

Figure 11. Availability of Wireless Internet Access in Public Library Outlets by MSA: Florida 2009

Workstation Issues

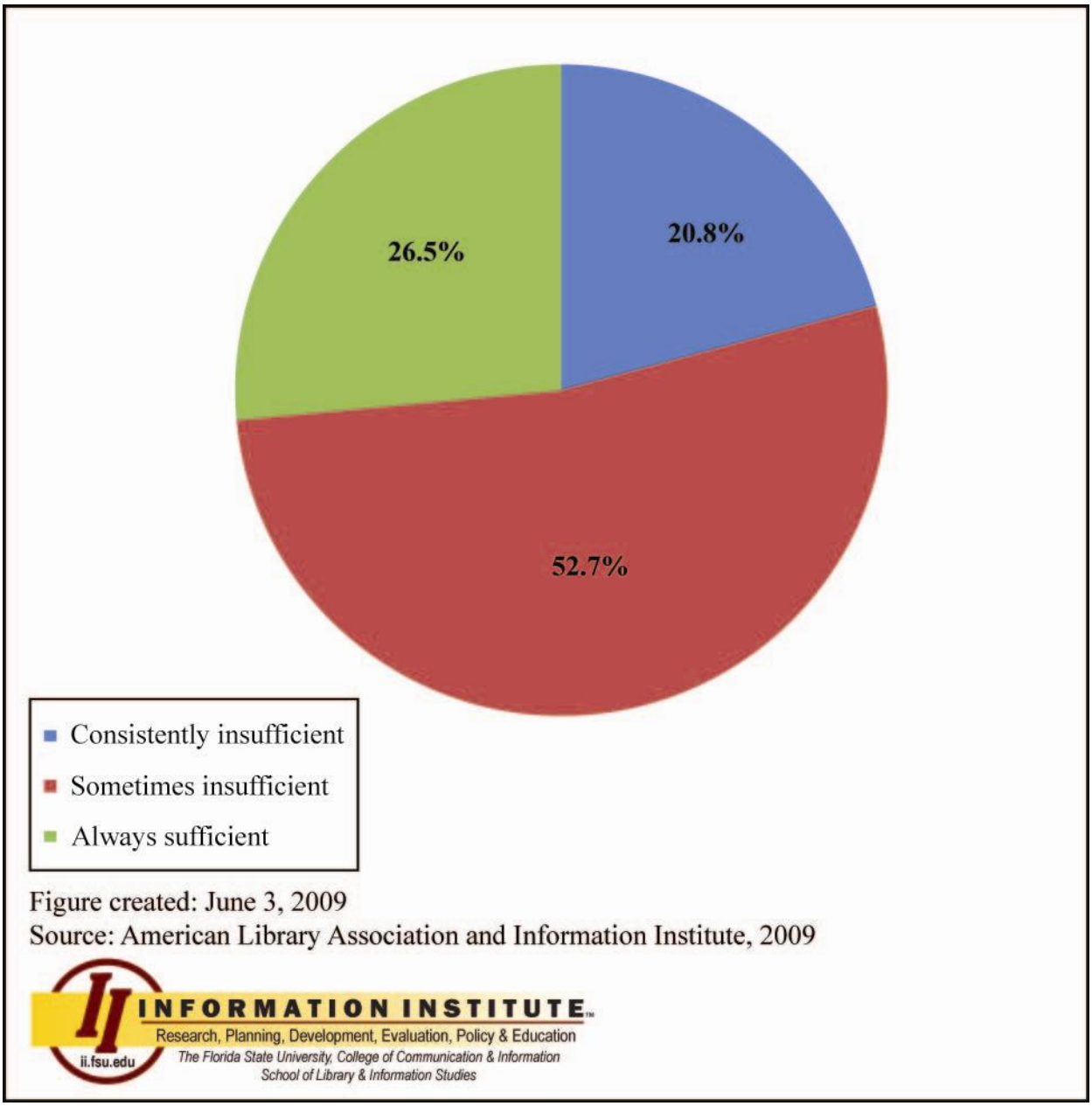

Figure 12. Sufficiency of Public Access Workstations in Relation to Resources: Florida 2009

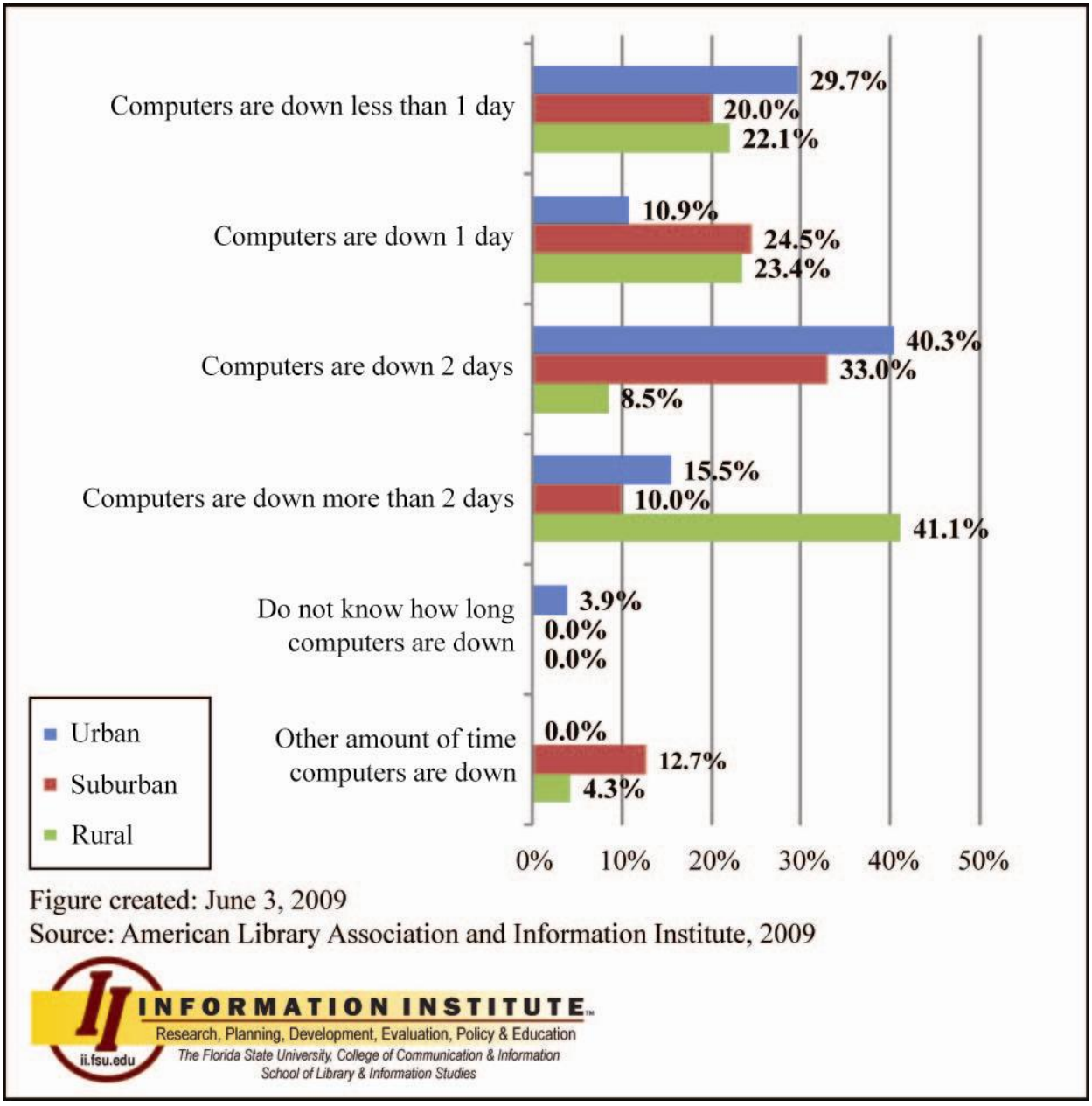

Figure 14. Length of Time Computers Are out of Service by MSA: Florida 2009

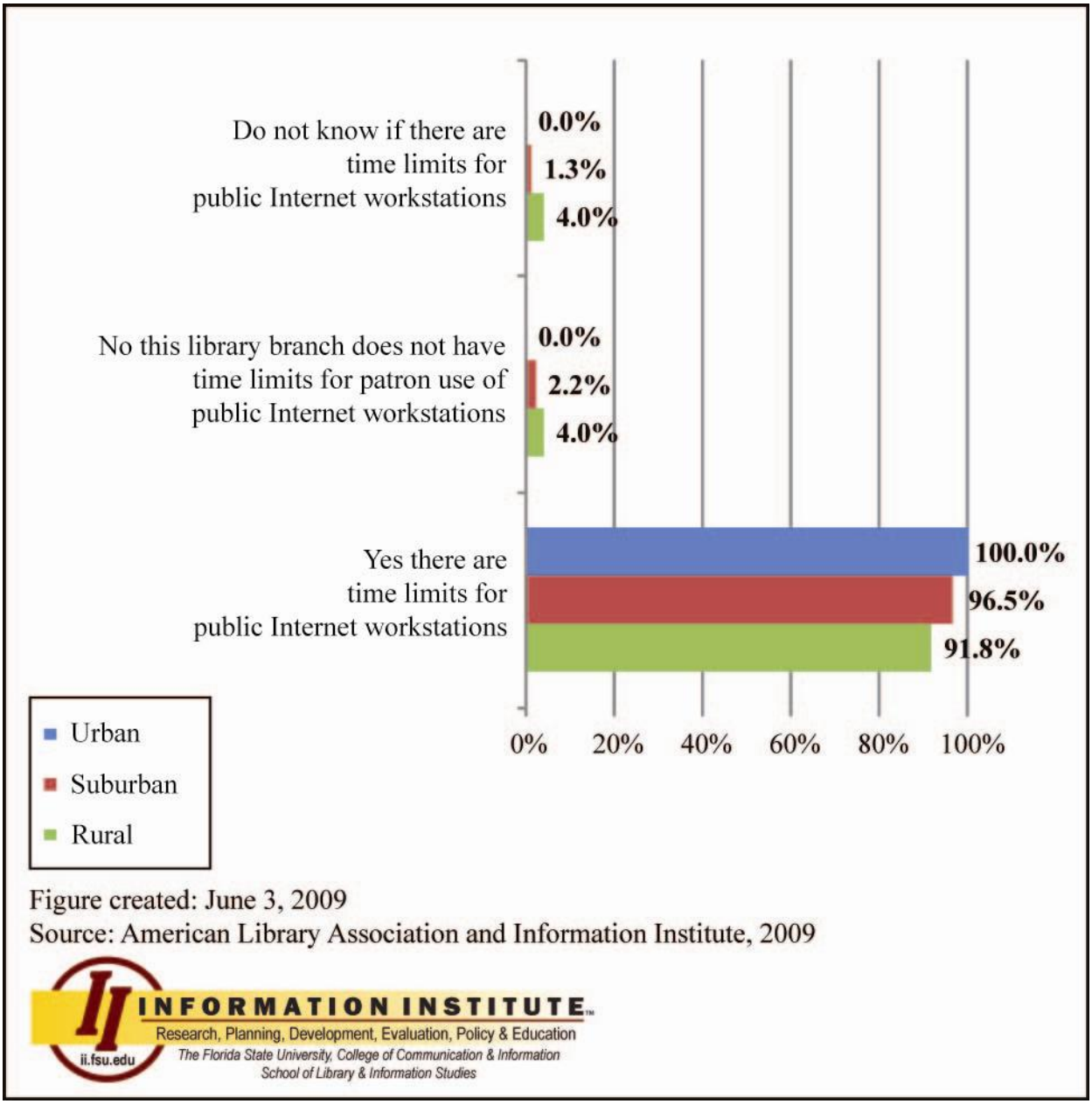

Figure 15. Current Time Limits for Patron Use of Public Internet Workstations by MSA: Florida 2009

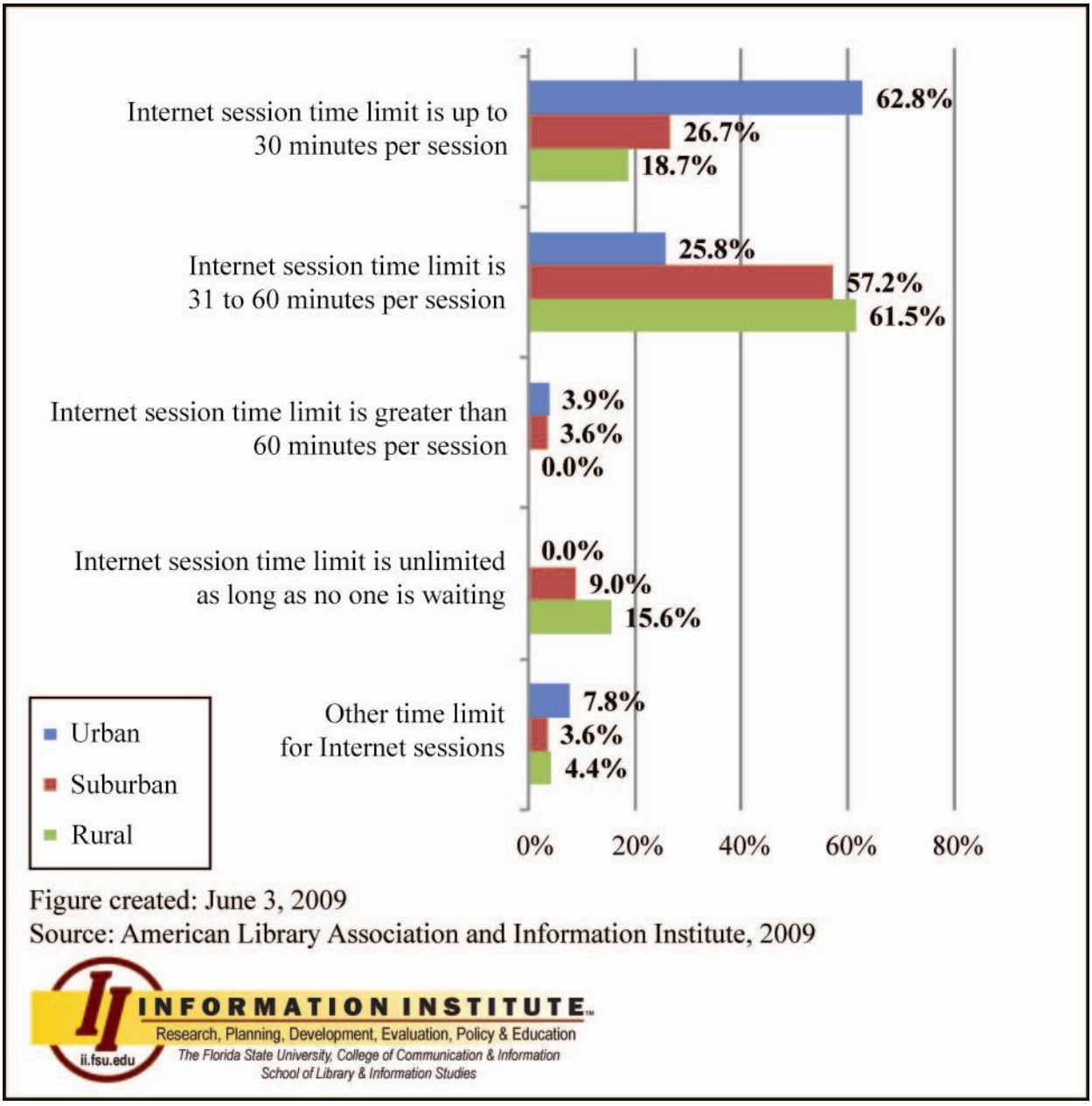

Figure 16. Period of Time Allowed per Session for Public Access Internet Workstations by MSA: Florida 2009

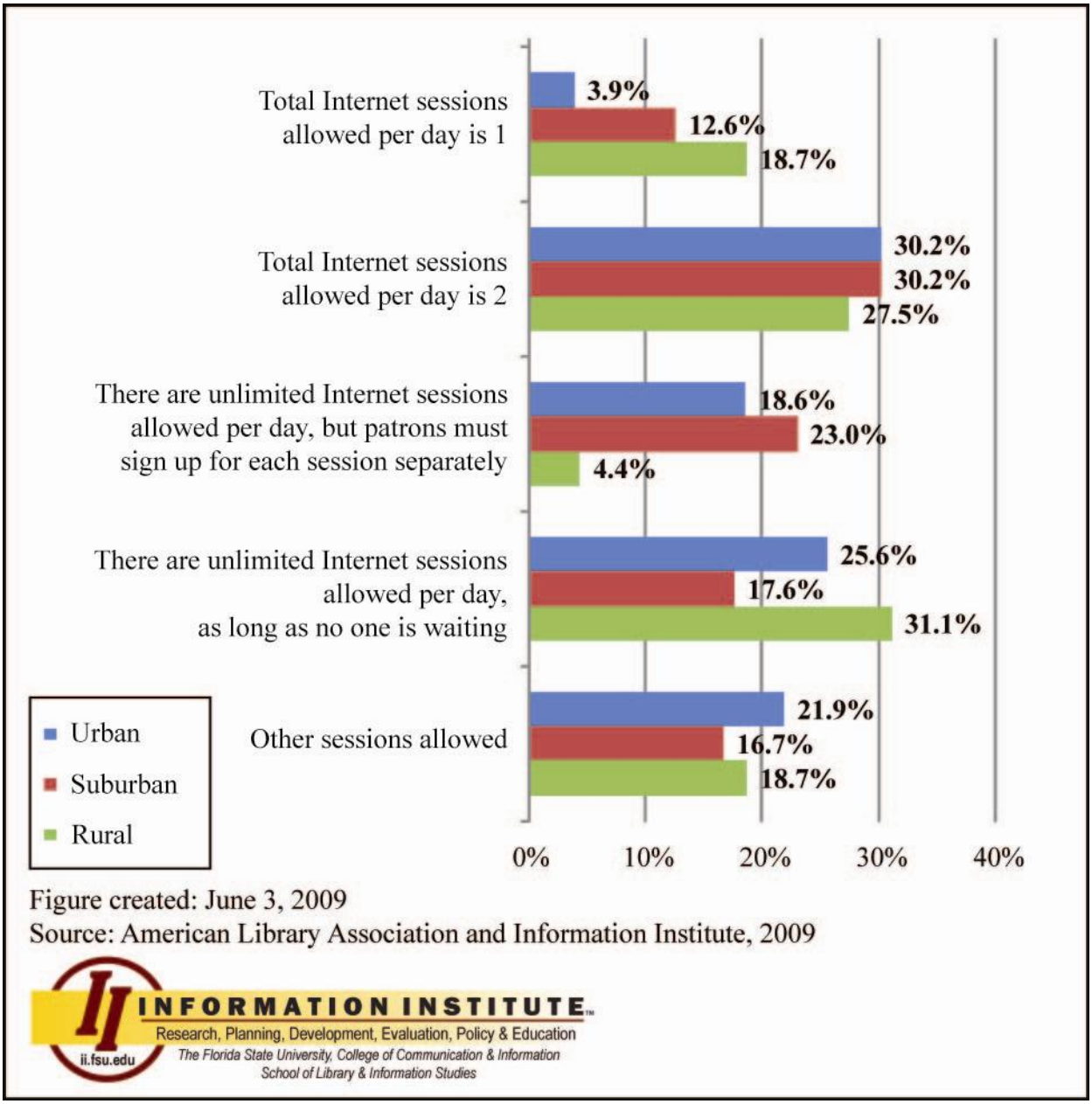

Figure 17. Number of Sessions Allowed Per Day for Public Access Internet Workstations by MSA: Florida 2009

Appendix E: Florida Broadband Maps

Public Library Internet Connectivity Speed and Cost by LATA

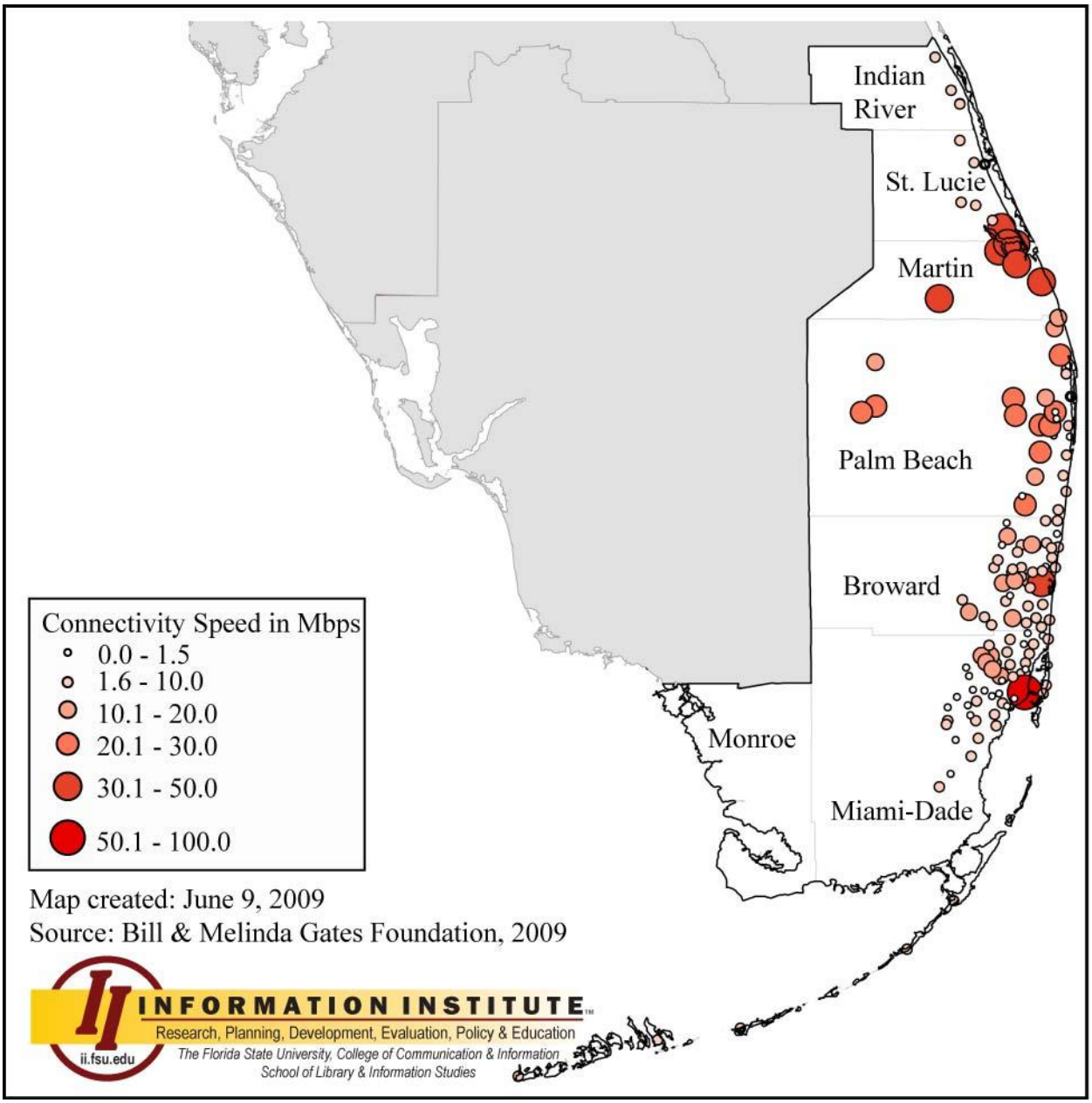

Figure 22. Public Libraries' Connectivity Speeds: Southeast Florida LATA 2009

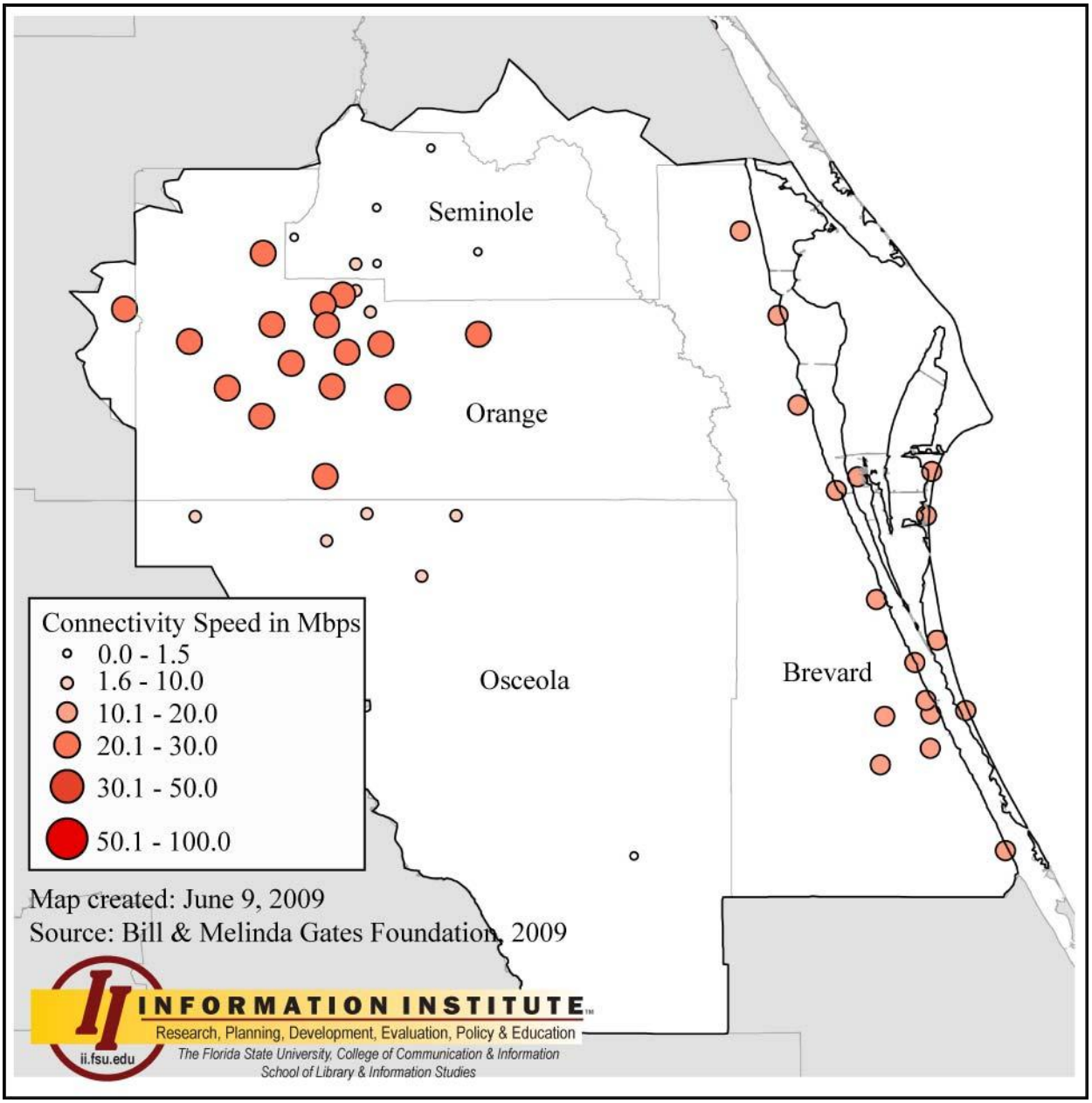

Figure 23. Public Libraries' Connectivity Speeds: Orlando Florida LATA 2009

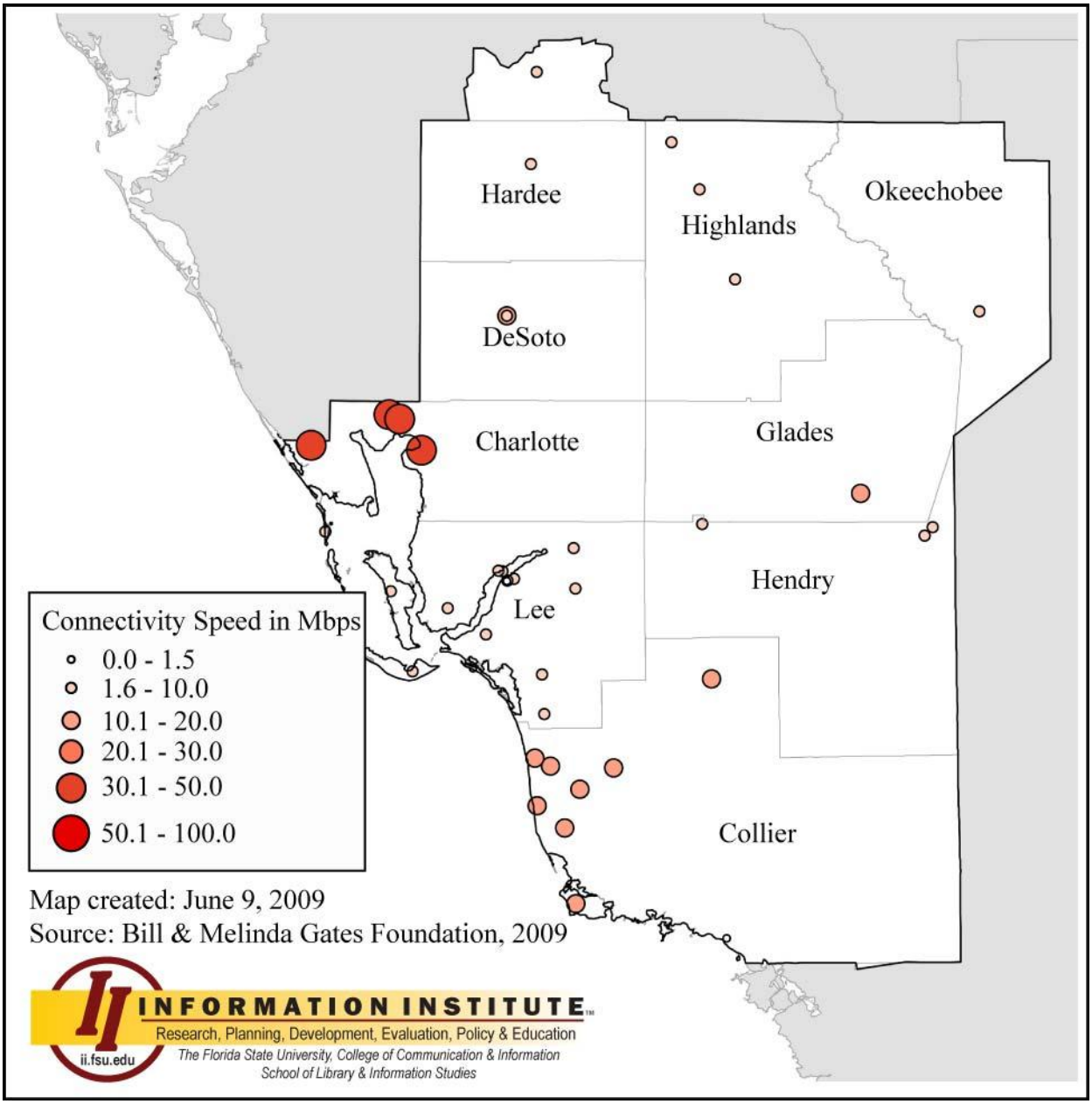

Figure 24. Public Libraries' Connectivity Speeds: Fort Myers Florida Market Area 2009

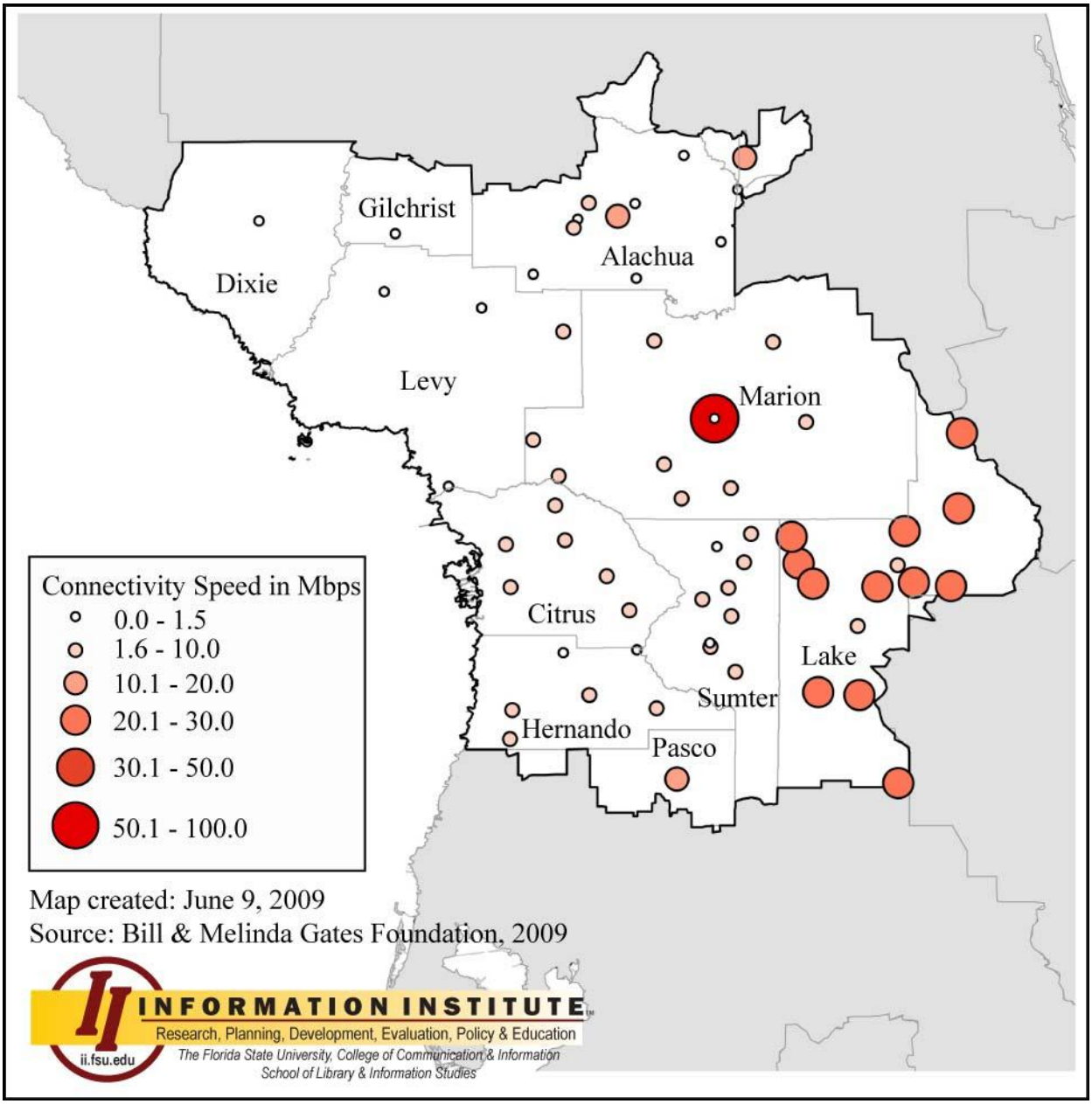

Figure 25. Public Libraries' Connectivity Speeds: Gainesville Florida LATA 2009

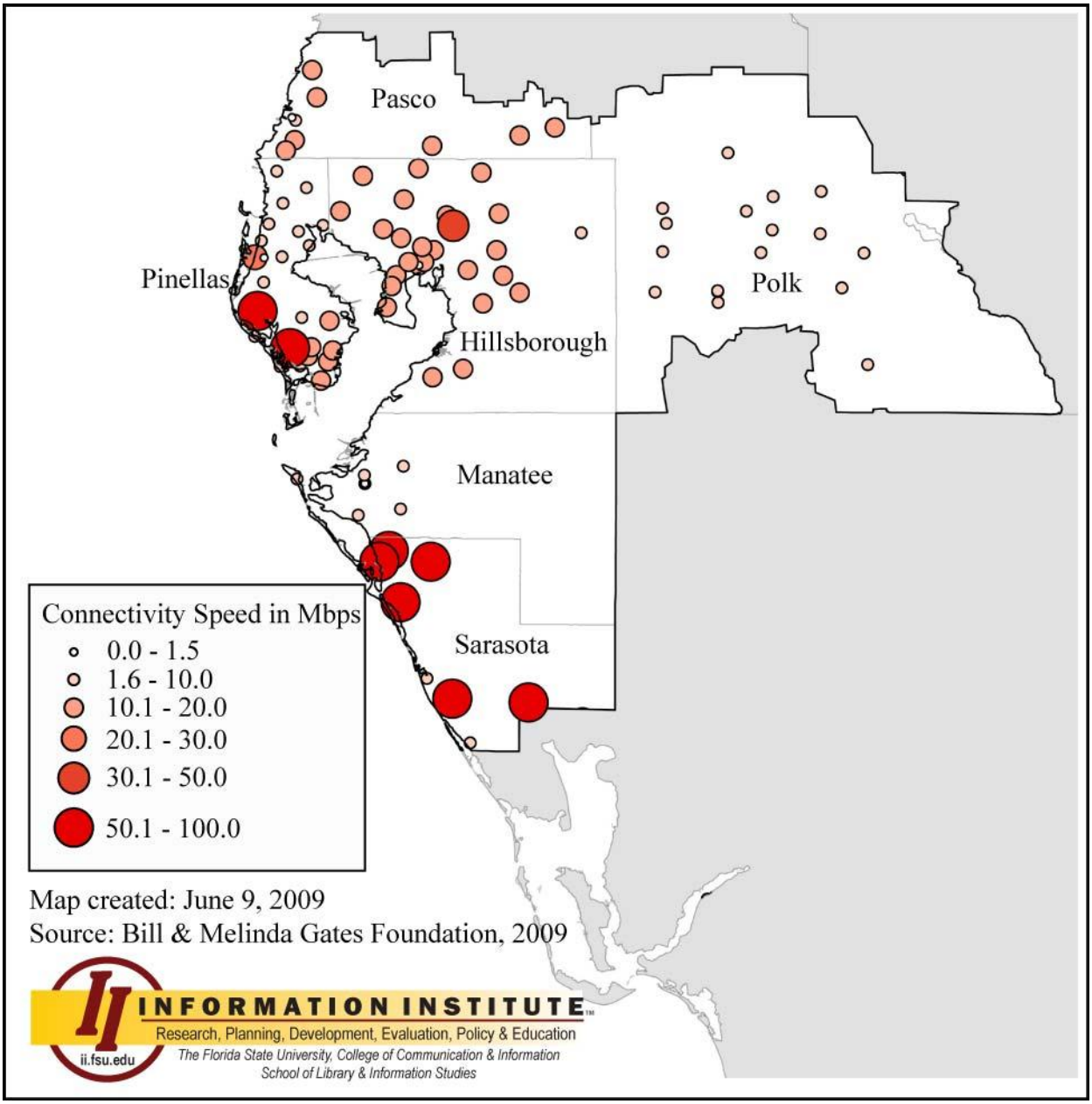

Figure 26. Public Libraries' Connectivity Speeds: Tampa Florida Market Area 2009

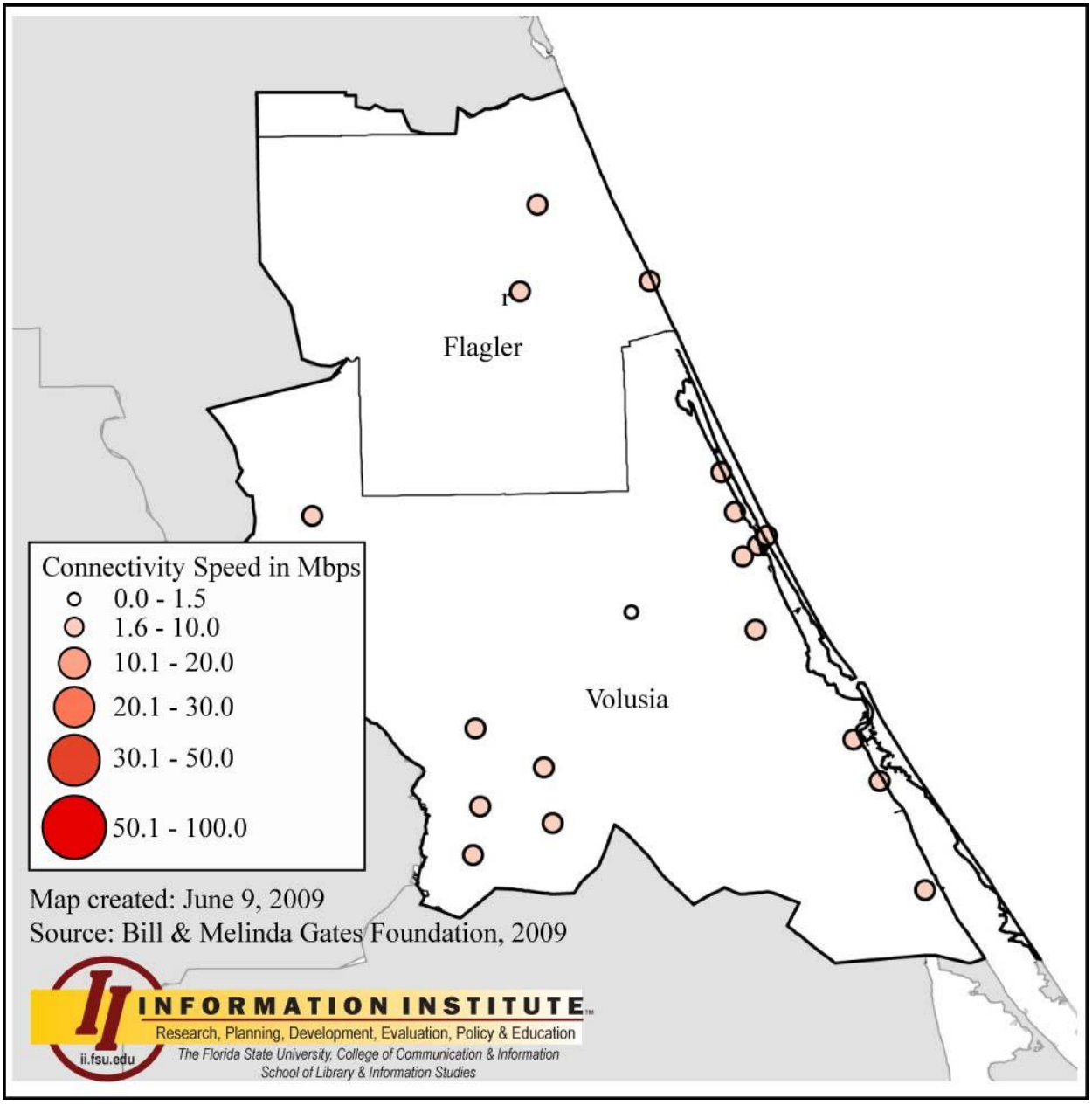

Figure 27. Public Libraries' Connectivity Speeds: Daytona Beach Florida LATA 2009

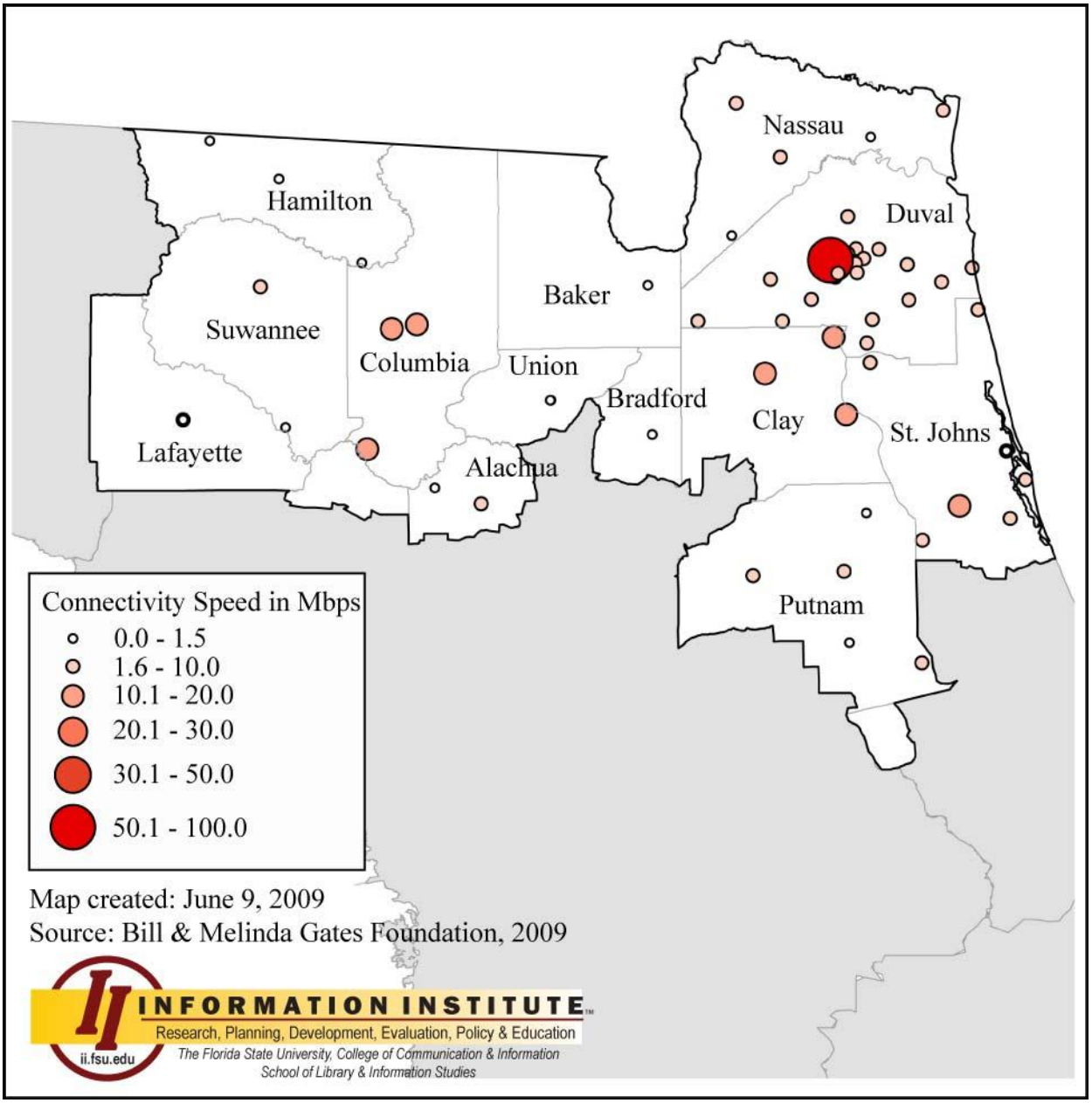

Figure 28. Public Libraries' Connectivity Speeds: Jacksonville Florida LATA 2009

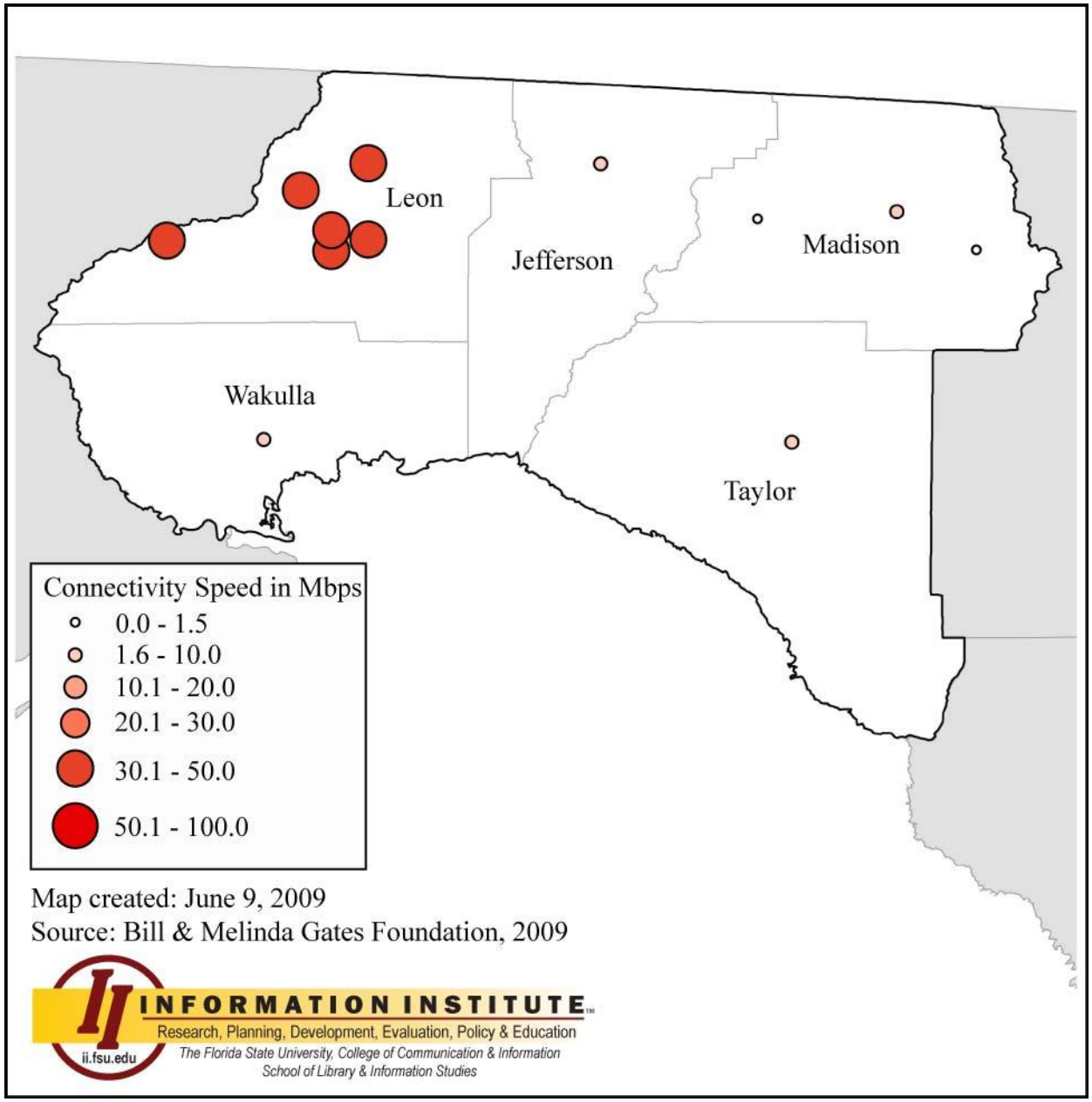

Figure 29. Public Libraries' Connectivity Speeds: Tallahassee Florida Market Area 2009

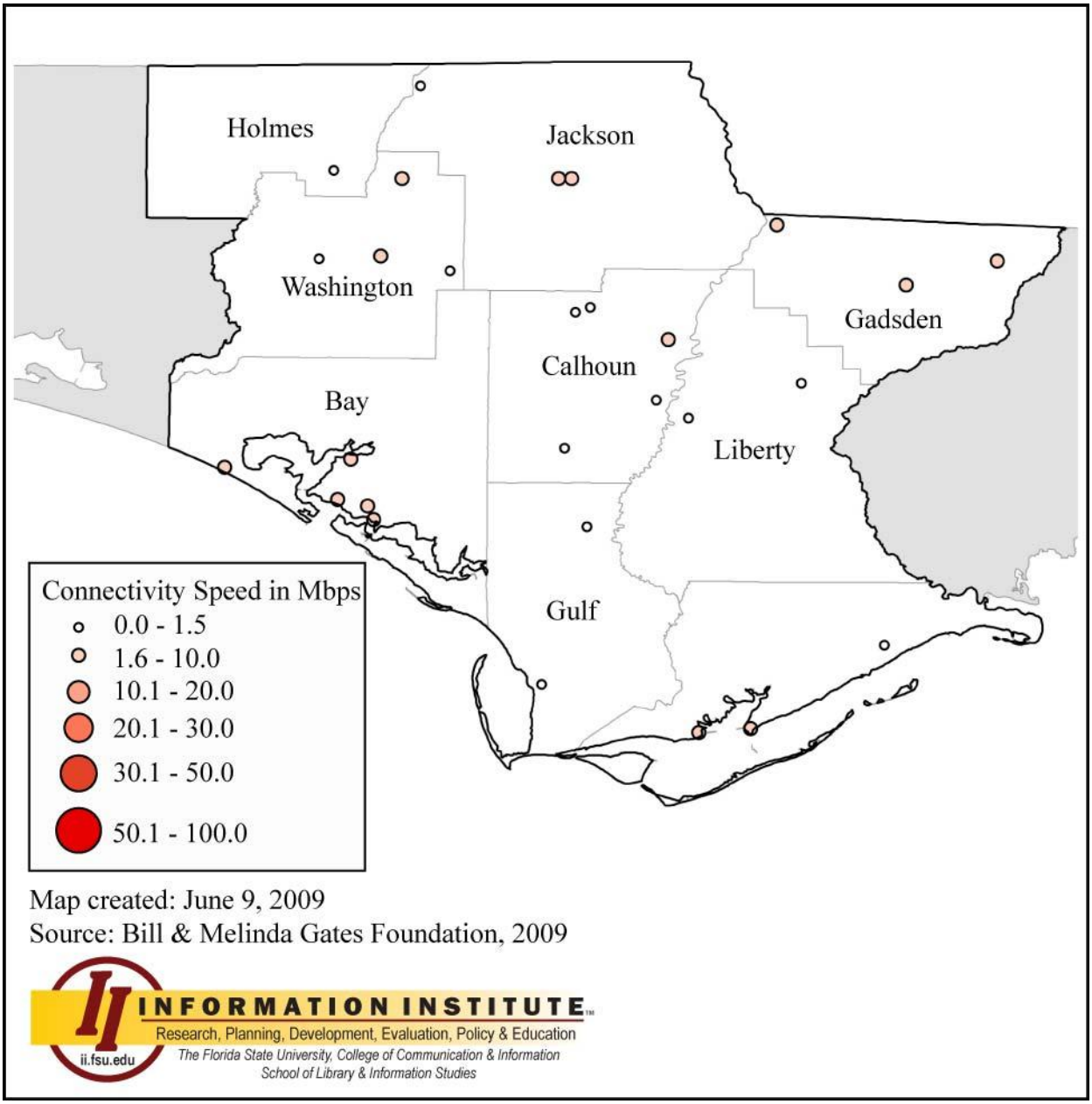

Figure 30. Public Libraries' Connectivity Speeds: Panama City Florida LATA 2009

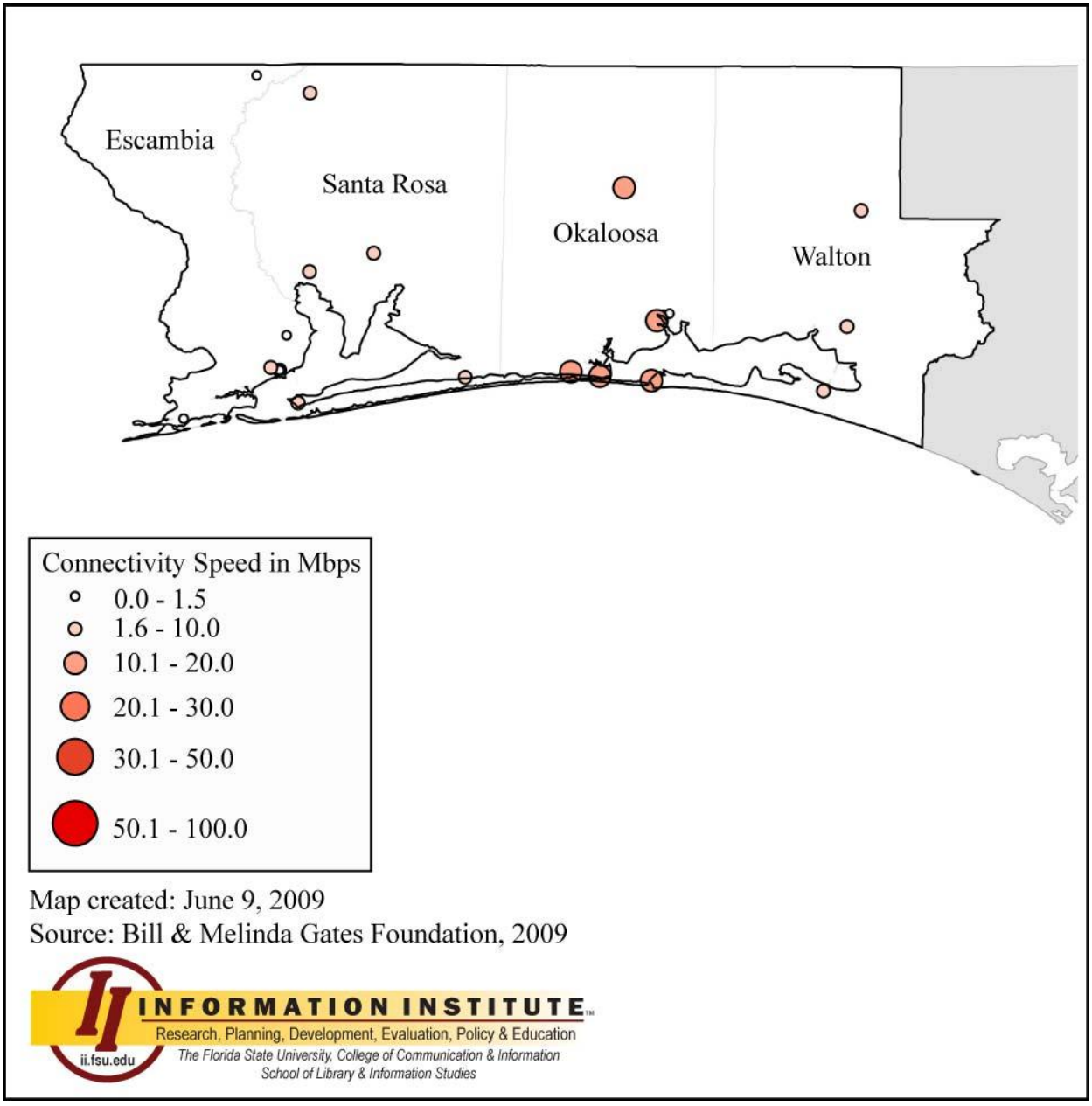

Figure 31. Public Libraries' Connectivity Speeds: Pensacola Florida LATA 2009

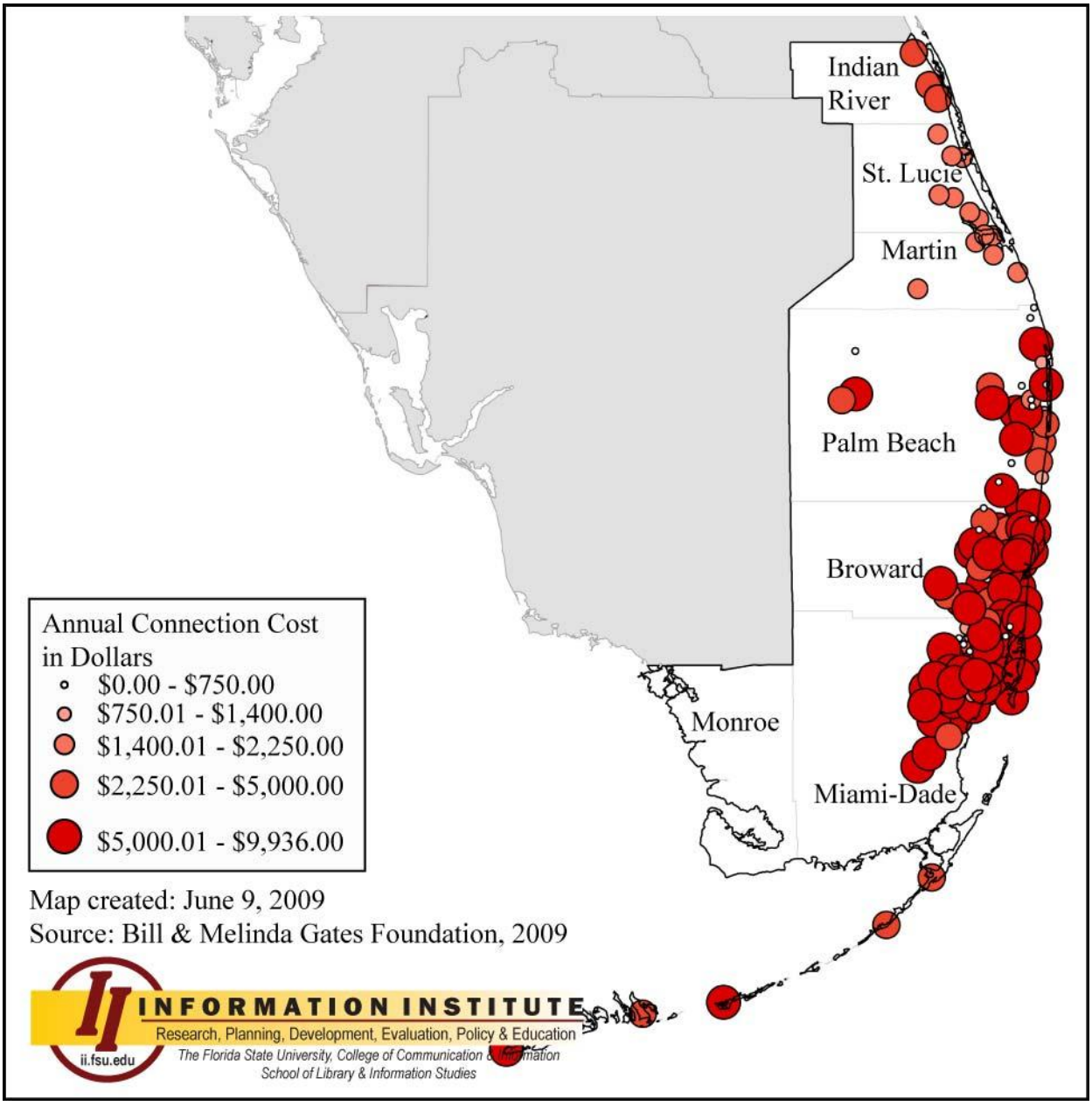

Figure 32. Public Libraries' Connection Costs: Southeast Florida LATA 2009

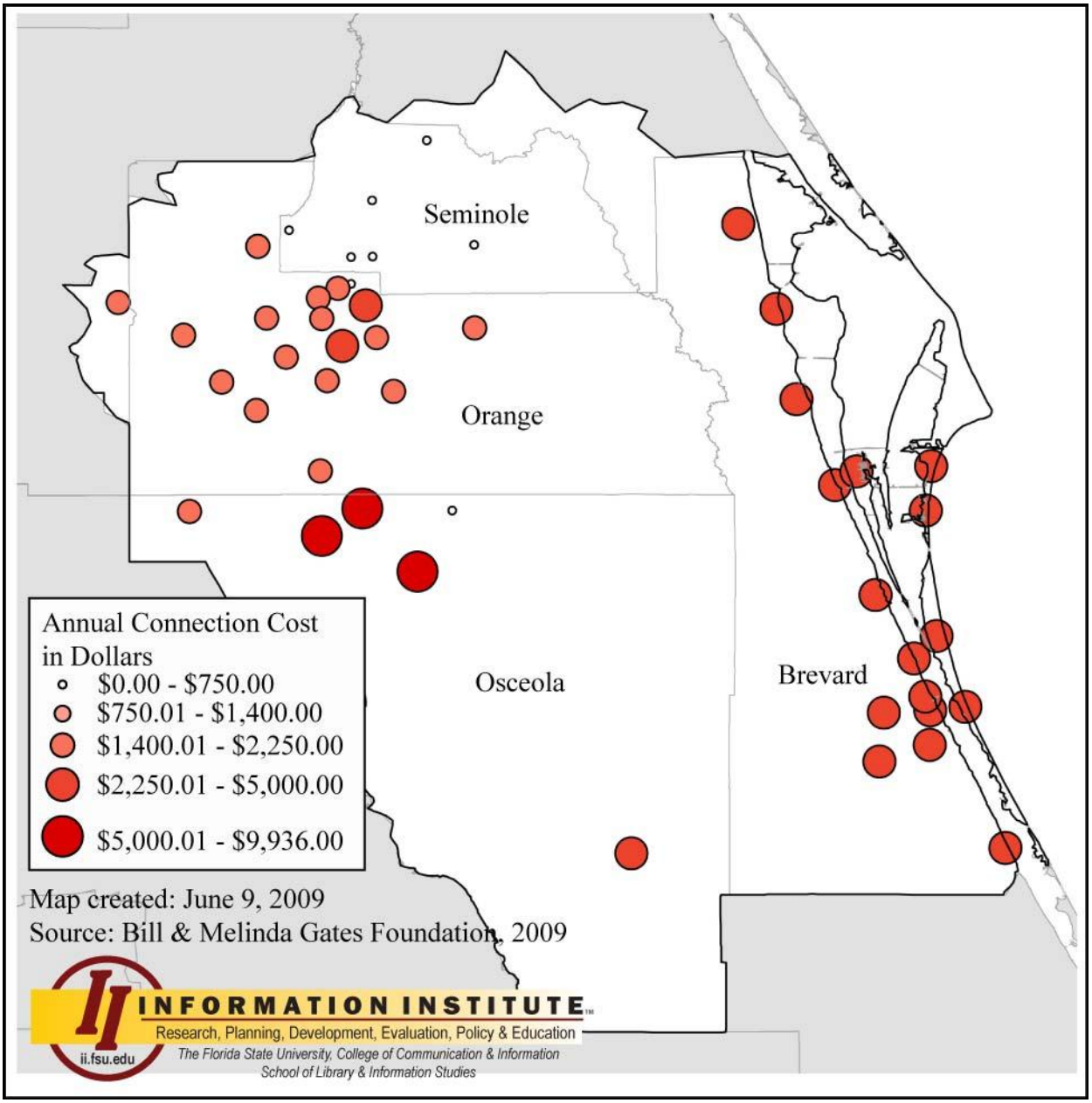

Figure 33. Public Libraries' Connection Costs: Orlando Florida LATA 2009

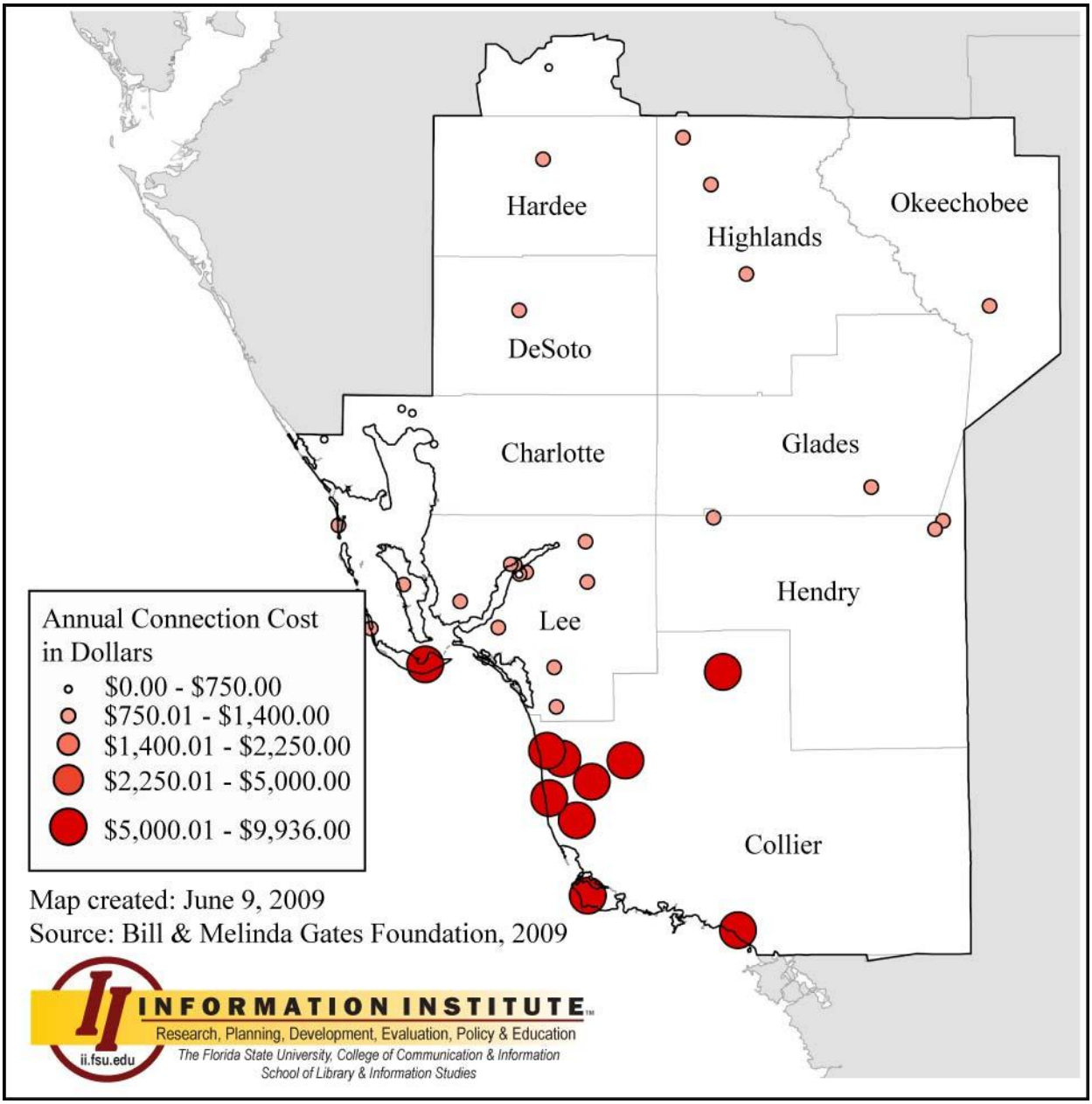

Figure 34. Public Libraries' Connection Costs: Fort Myers Florida Market Area 2009

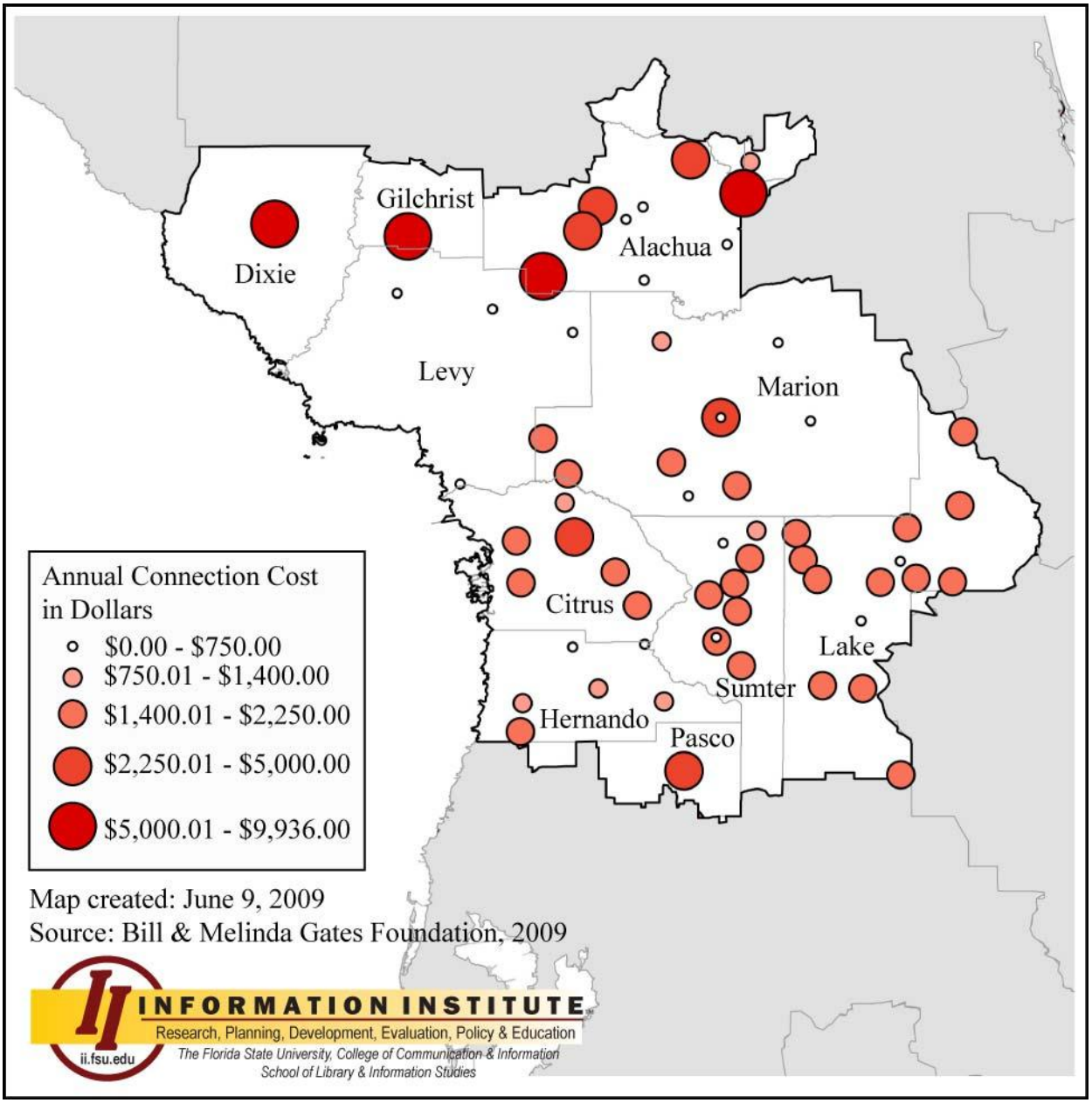

Figure 35. Public Libraries' Connection Costs: Gainesville Florida LATA 2009

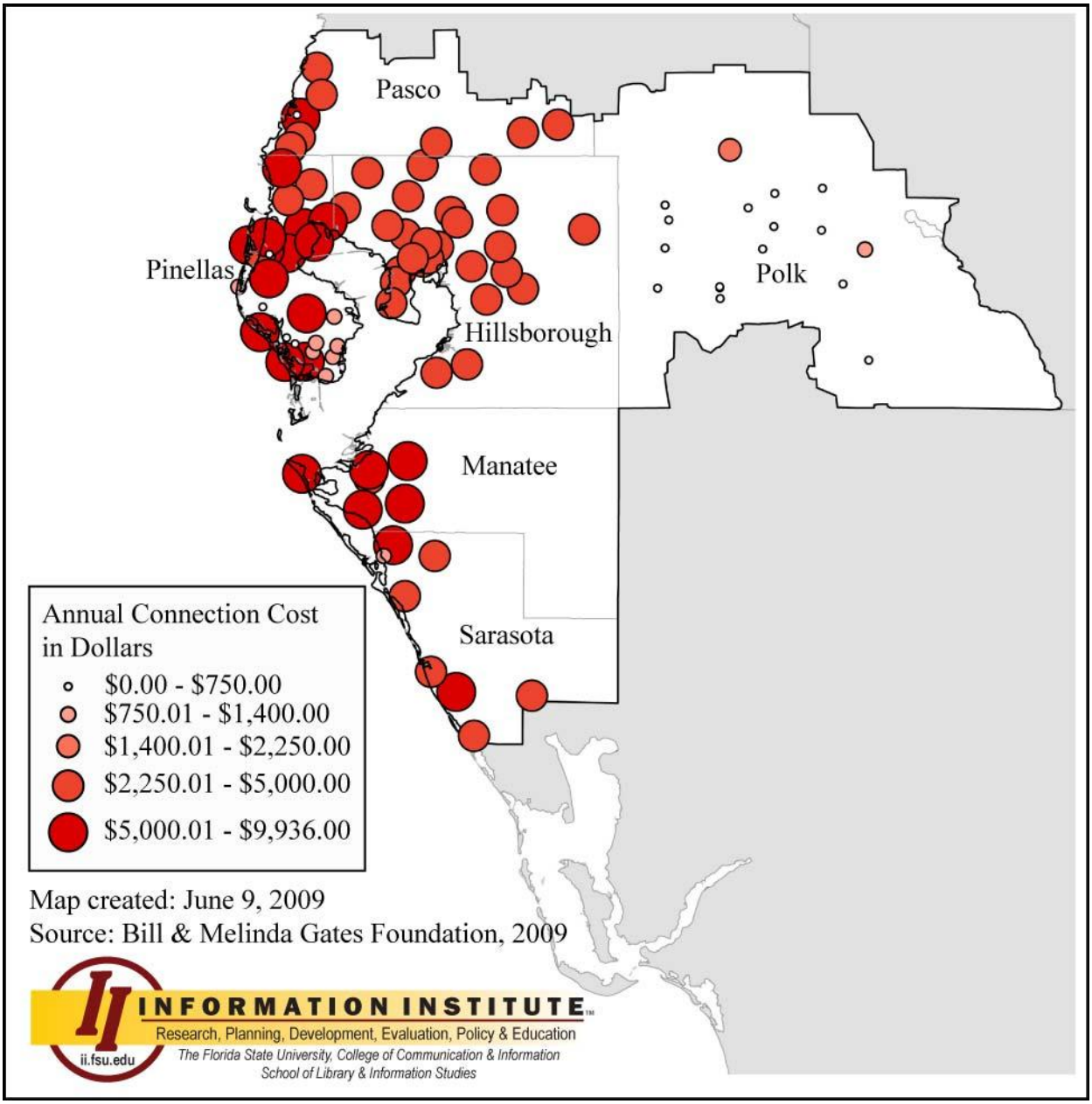

Figure 36. Public Libraries' Connection Costs: Tampa Florida Market Area 2009

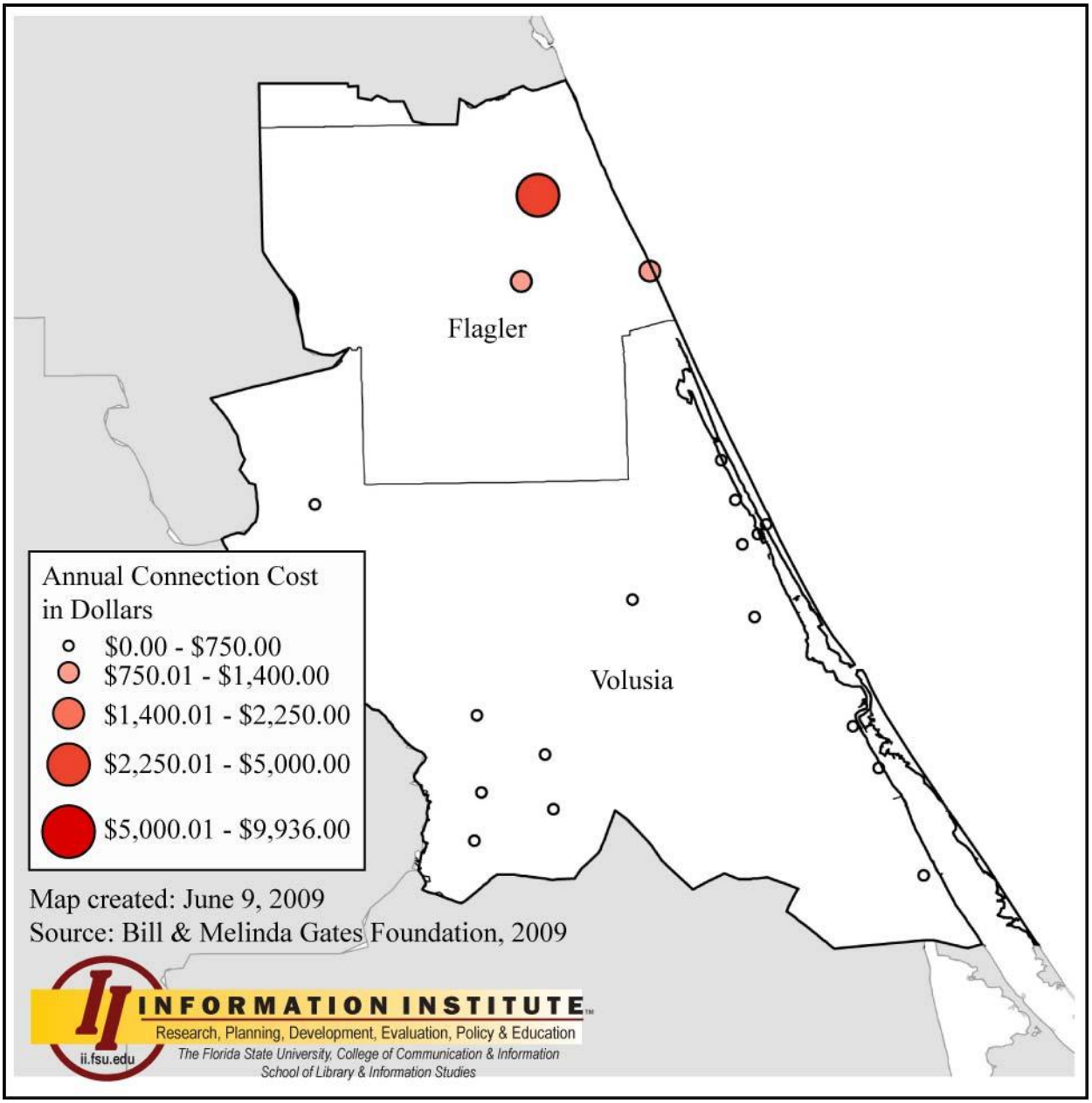

Figure 37. Public Libraries' Connection Costs: Daytona Beach Florida LATA 2009

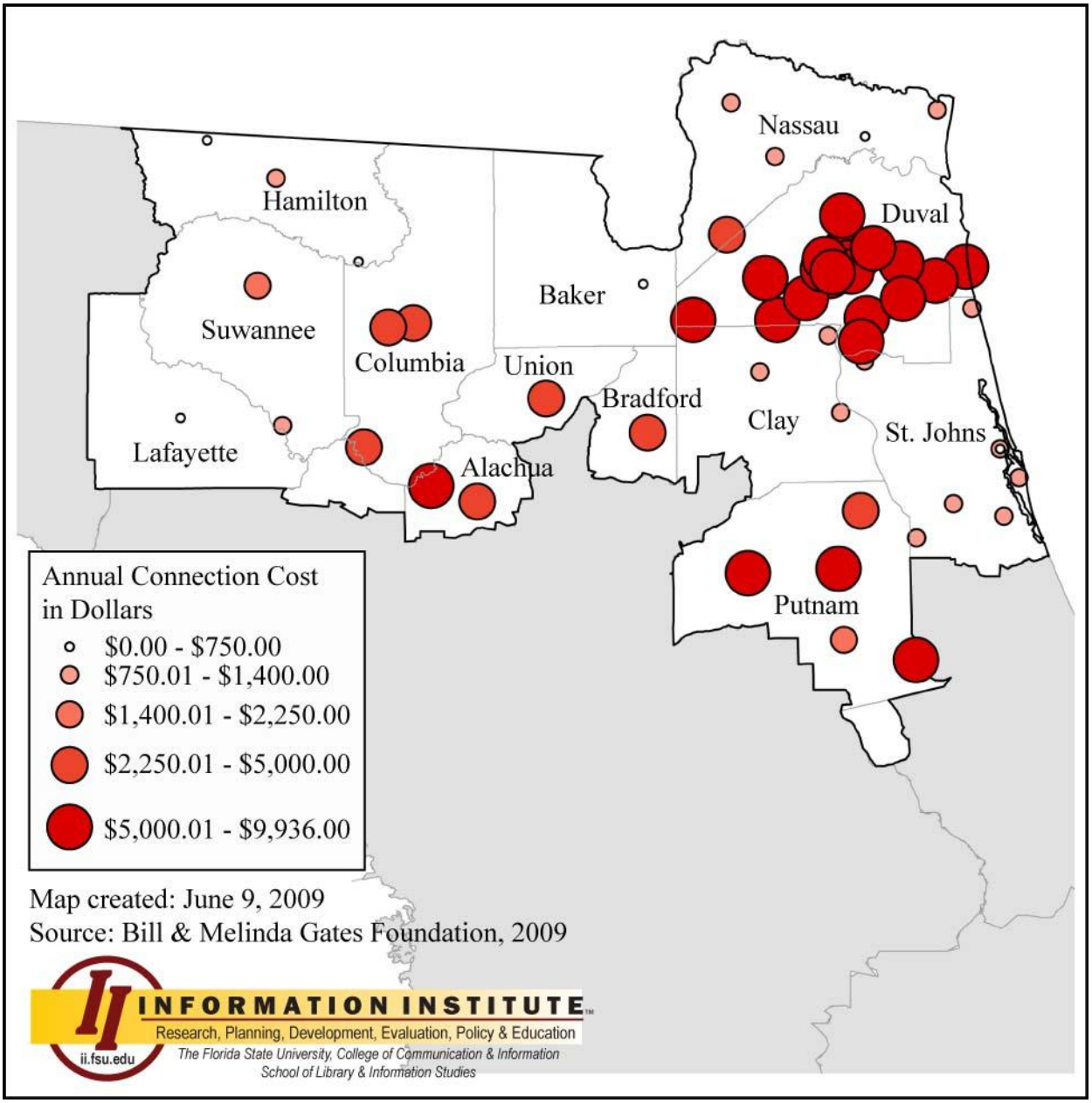

Figure 38. Public Libraries' Connection Costs: Jacksonville Florida LATA 2009

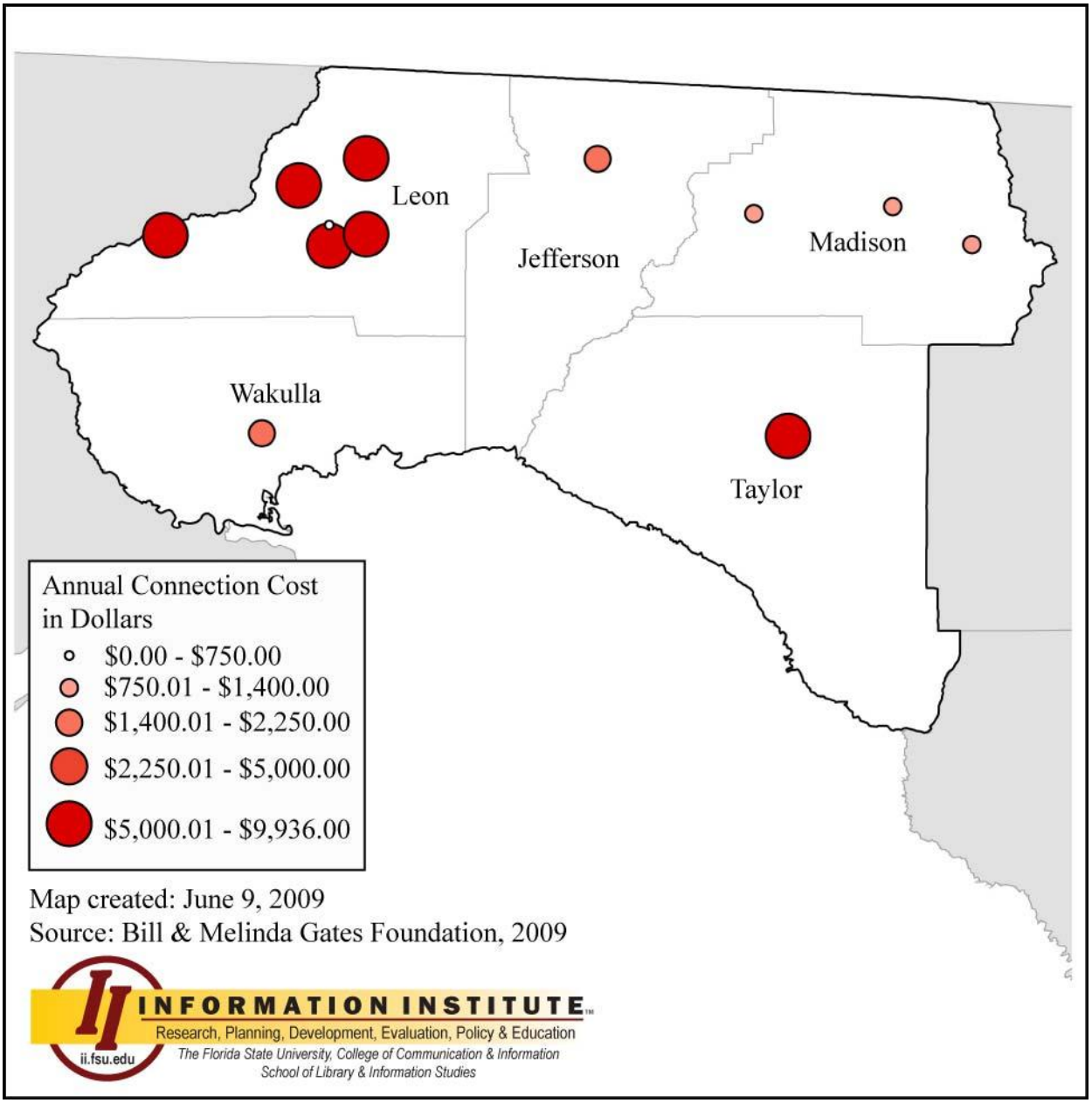

Figure 39. Public Libraries' Connection Costs: Tallahassee Florida Market Area 2009

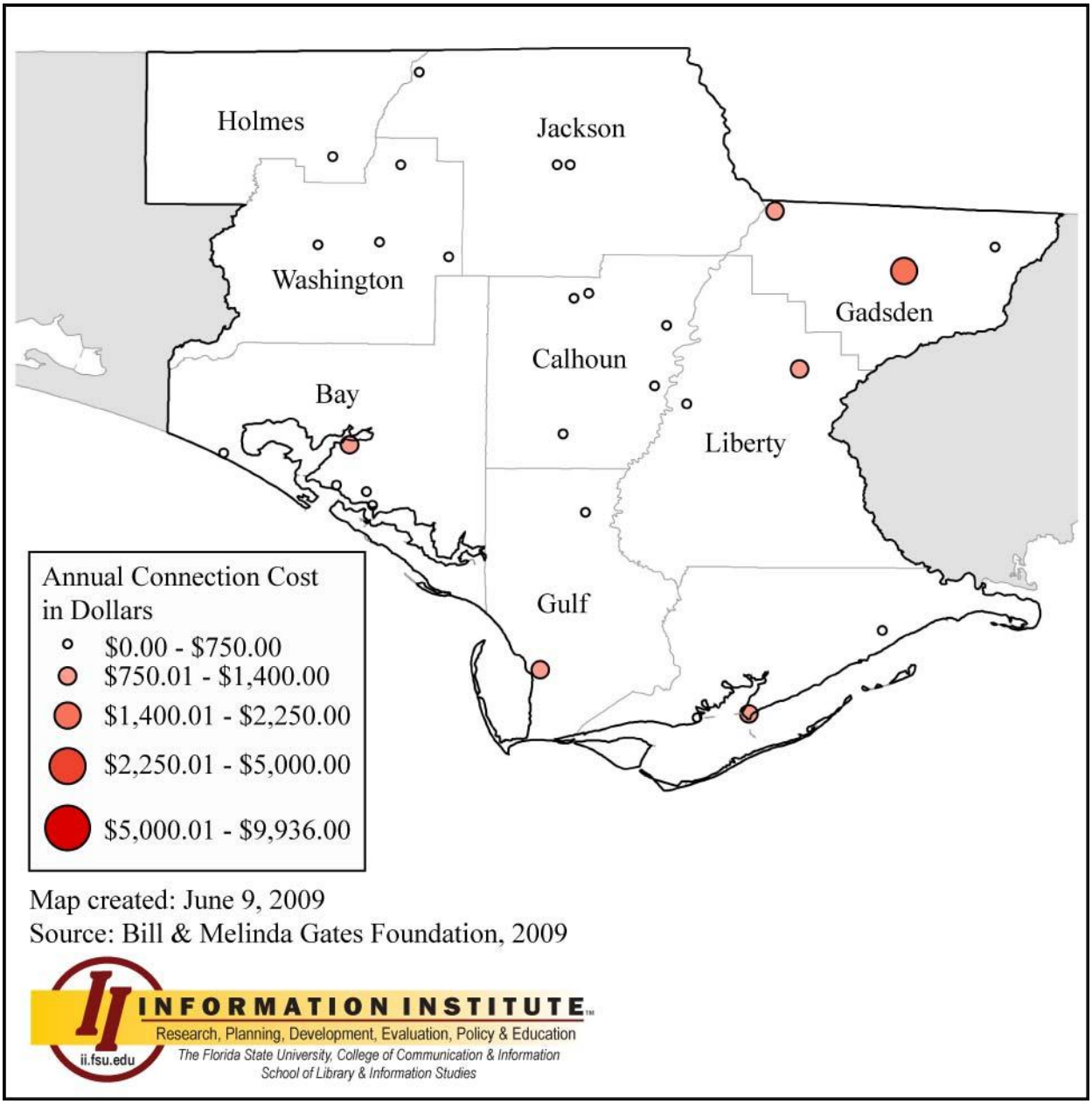

Figure 40. Public Libraries' Connection Costs: Panama City Florida LATA 2009

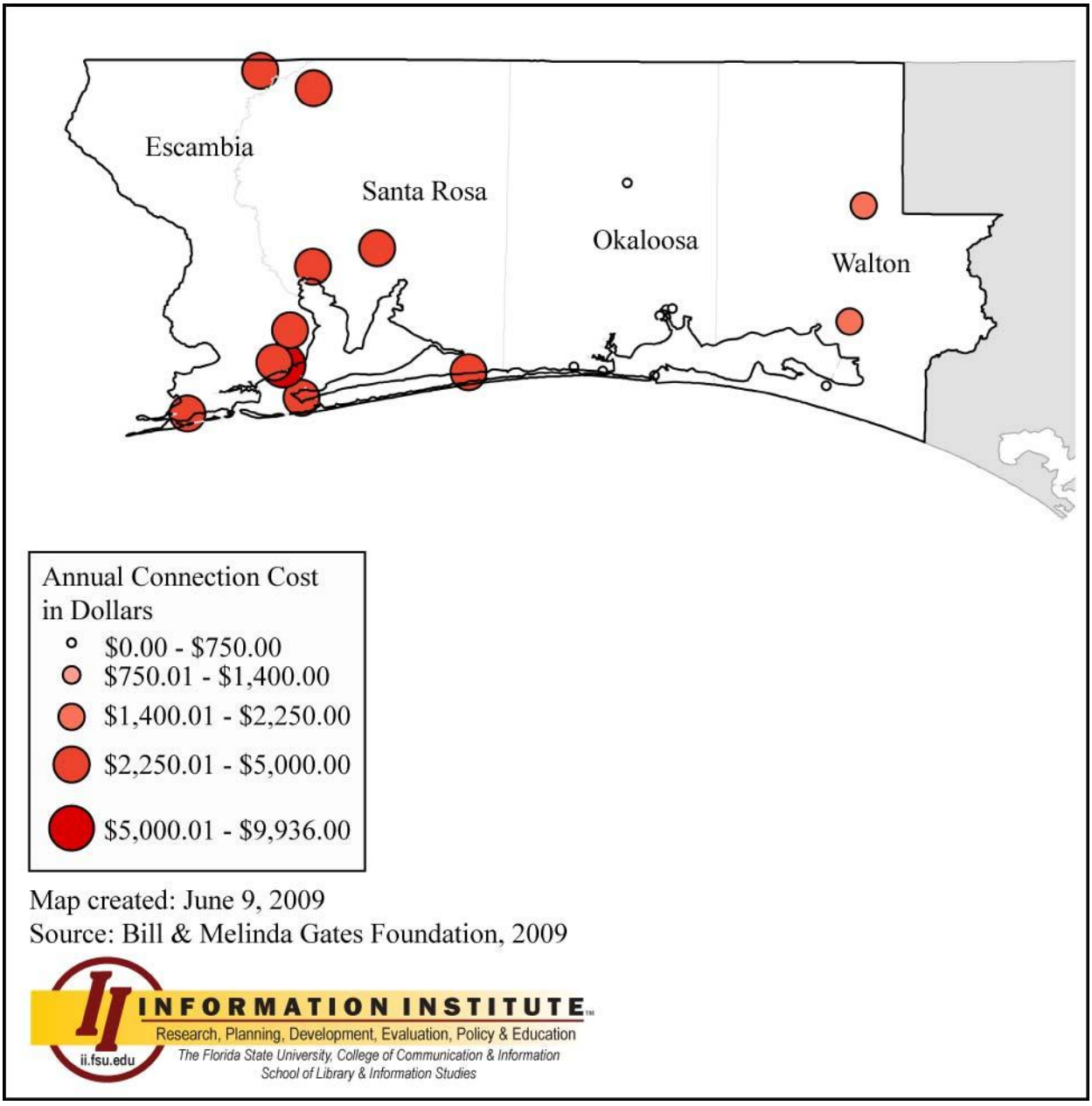

Figure 41. Public Libraries' Connection Costs: Pensacola Florida LATA 2009