

Friends of the Urban Forest & San Francisco Department of Public Works, Bureau of Urban Forestry

Customer Success Story

Autodesk Geospatial Solutions
MapGuide Open Source

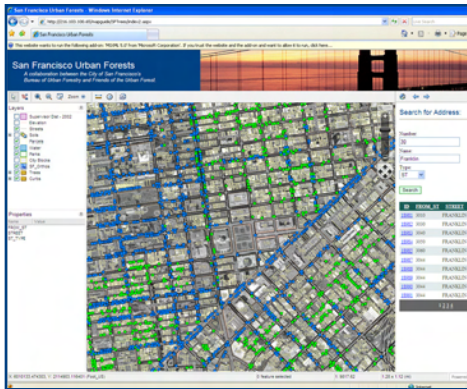


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Amber Bieg
Development Officer
Friends of the Urban Forest

Creating a Greener San Francisco

Open Source Geospatial Software Helps City Protect the Urban Forest



The San Francisco Urban Forest Mapping System quickly maps BUF and FUF trees based on an address location search. This example shows trees surrounding City Hall.

Project Summary

San Francisco is widely known for being eco-friendly and "green." Two local groups, the Friends of the Urban Forest (FUF) and the San Francisco Department of Public Works, (DPW) Bureau of Urban Forestry (BUF) partnered to help protect trees, ensuring that the city's reputation endures. With support from Autodesk and a local GIS developer, the team is efficiently maintaining and enhancing the city's urban forest.

Using MapGuide Open Source, FUF and BUF are working together to:

- Create an open source urban forest management application
- Offer the application to cities and agencies around the world for free download
- Improve interagency communication
- Streamline manual workflows
- Develop an accurate cost/benefit analysis for San Francisco's urban forest
- Increase public access to urban forest information
- Encourage public participation and volunteerism

The Challenge

It is no secret that trees deliver substantial economic, environmental, and aesthetic benefits. And, their role is even more important in the hustle and bustle of San Francisco. Trees absorb rain, reducing runoff and lessening the burden on the sewer and storm water systems. Trees reduce wind and provide shade that lowers the energy costs of nearby buildings. Green landscapes reduce carbon dioxide and absorb air pollutants, improving the city's air quality. Attractive, green landscapes and tree-lined boulevards attract more tourist dollars and improve property values. Not to mention, they provide an excellent habitat for birds and other wildlife. And, recent studies have linked trees and green landscapes to reduced crime, stronger inner city communities, and a greater sense of optimism among citizens.

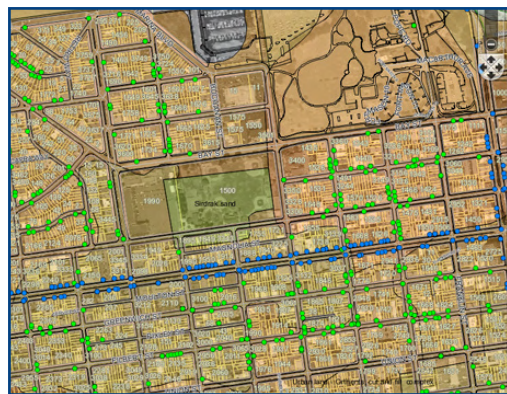
Understanding the value in planting and maintaining trees, two groups are actively adding new specimens to the landscape. Although they operate in very different ways, BUF and FUF share a common goal: to maintain and enhance the city's urban forest.

A public agency, BUF takes the initiative to find streets or neighborhoods in need of beautification through tree plantings. BUF crews and other



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Alex Fordyce
Senior GIS Developer
Online Mapping Solutions



Users can search for species and overlay soil types in a San Francisco neighborhood. In this marina district example, BUF trees are represented as blue dots and FUF trees as green.

city employees are responsible for planting and maintaining these trees for the long term. On the other hand, FUF relies on donations, community input and volunteers. Friends of the Urban Forest works directly with neighborhood groups and helps community leaders organize plantings. This volunteer organization teaches the neighborhood to care for the young trees and it is the community, not the city, that is responsible for long-term maintenance of these privately donated trees.

Pushing the Limits of Traditional Databases

As separate entities, BUF and FUF maintain two separate and large tree databases. Although the databases' combined 140,000 entries contain useful details about trees, species type, planting date, planting team, and maintenance dates, both databases were incomplete and difficult to use. And, with more than 5,000 trees planted each year, the databases were difficult to maintain on modest city government and volunteer organization budgets. In addition, the government-funded BUF couldn't exchange tree and asset data with its community-based ally, FUF. Their databases were not interoperable.

As Greg Braswell, IT Manager for the Department of Public Works Bureau of Engineering, explains, “Our groups have to communicate and share information for about 5,000 new trees a year – mostly by paper. As you would imagine, a non-profit and public agency have very different management styles, which made communication difficult. Each organization wanted to know how many trees were planted each year, each month, and who paid for them.”

Braswell adds, “These two groups needed a way to seamlessly share asset information. Both FUF and BUF required a sensible way to share current projects and create an up-to-date picture of San Francisco's urban forests.”

The Solution

Amber Bieg, FUF's Development Officer, envisioned an integrated Web-mapping tool that San Francisco citizens can use to update information about their favorite trees, even adding a photo or personal stories. Bieg had organized a tree-mapping project in Los Angeles several years prior and understood the value of

involving the community in gathering tree data. But, she realized that the information must be current and dynamic to be useful to the city and its citizens.

“I wanted to give citizens access to tree information – letting them search for trees in their neighborhood or learn if a particular species will thrive in their area before planting it,” says Bieg. “By empowering citizens to understand the benefits of local trees or the urban forest as a whole, we can transform their enthusiasm into financial support for public and private urban forestry efforts.”

Securing Project Support

With support from Marshall Foster, the Director of City Greening in the Mayor's office, Bieg and the FUF team sent a detailed proposal to the Department of Public Works. Eventually, Greg Braswell received the proposal and quickly realized that a Web-mapping tool could streamline the BUF team's processes as well. In addition, it would make the organization more effective by increasing data accuracy and completeness, facilitating cost/benefit analyses and reducing the risk of damage from diseased trees.

“Red tape and funding issues could have stalled the project,” says Braswell. “But, I saw great potential in Amber's idea. I looked outside the city government and asked Autodesk to sponsor the project.” Autodesk agreed to sponsor the project, contracting Online Mapping Solutions of Santa Cruz, California, to develop the online tree-mapping solution.

Foundation Built on Open Source Technology

With secure funding and development support, the team created the San Francisco Urban Forest Mapping System. The system integrates the BUF and FUF databases – displaying a comprehensive, interactive, and attractive view of the urban forest. The system is based on MapGuide Open Source, which delivers seamless communication between each database and displays the assets and attributes on an intuitive and interactive map. Both BUF and FUF staff see the same interface and can view the other's asset data.

The Web interface lets BUF and FUF employees and volunteers quickly and easily update tree



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Amber Bieg
Development Officer
Friends of the Urban Forest

records in real-time. And, San Francisco citizens can log onto the site and add trees from their homes. Users can search for assets by street, species, planting date, or the organization responsible for tree maintenance. Finally, urban foresters have the tools to efficiently manage their assets.

Carla Short, an Urban Forester with BUF, says, “Having an intuitive, visual map of where our trees are located helps our planting initiatives. We can quickly see where trees are needed to ensure coverage throughout the city. Also, with instant access to tree planting dates and care history, BUF can easily plan maintenance schedules. We can map the shortest routes for maintenance crews – directing them to the correct trees in minimal time.”

“Combined with a highly scalable architecture and an API (application programming interface) based on industry standards, MapGuide Open Source provides us with a great technology platform on which to develop this large integration project,” says Alex Fordyce, Senior GIS Developer at Online Mapping Solutions. “And, there is a vibrant open source development community developing around the technology. If the application hits a roadblock, there are peers who are available and willing to help us overcome it.”

Engaging the Public

The project designers wanted to engage the public to make the system as accurate as possible. With a straightforward interface and elegant design, anyone with an internet connection can use the application without special GIS training. Citizens will visit the site to add or correct data.

Braswell explains, “By simply clicking on the map, a person can let us know that we’ve missed their favorite old oak tree. This information is instantly passed to BUF and FUF, who can verify that the tree exists and add it to their database. Citizens feel like they are taking an active role in protecting San Francisco’s urban forest – and they truly are.”

BUF is eager to use the mapping system as an outreach tool as well, educating the public about protecting the city’s urban forest. “Many citizens are unfamiliar with our agency and are unaware of our mission,” explains Short. “With the San Francisco Urban Forest Mapping System, citizens have an interactive tool to find a tree and learn about its species, history, and future. This interaction will go a long way in engaging the public in our efforts and demonstrating the benefits the urban forest brings.”





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Carla Short
Urban Forester
Bureau of Urban Forestry

Cost/Benefit Analysis

While trees provide many great benefits to their communities, San Francisco was not able to calculate these benefits on a tree by tree basis and compare them to the costs of planting, maintaining and caring for trees in real time. Although previous studies had given the city approximate calculations, San Francisco did not have accurate, real-time information for each tree in the urban forest. That is, until the team applied an existing software program designed to accurately create an ongoing cost/benefit analysis of a city’s entire urban forest.

The program, STRATUM (Street Tree Resource Analysis Tool for Urban Forest Managers), was developed by the USDA Forest Service Center for Urban Forest Research at the University of California, Davis. STRATUM examines all the benefits of trees, such as reduced energy costs, improved air quality, and reduced runoff, and analyzes them against the costs of planting and maintenance.

While the analysis is still underway in San Francisco, other major cities use STRATUM to demonstrate that their urban forests are excellent investments. For example, the cities of Chicago, Illinois; Fort Collins, Colorado; and Modesto, California, all receive approximately \$2 in benefits for every dollar spent on forest programs, essentially doubling the investment.

The Result

“The most amazing part of this project is that three very different organizations have come together to create a tool that serves to benefit the entire community – a rare situation,” says Bieg. “Not very often do a non-profit organization, a bureaucratic agency, and a for-profit corporation partner to create a tool for the community. I am excited to be part of this unique project and amazing partnership.”

Open Source Open Doors

Because the project is based on open source software, the team expects to share the application

with organizations worldwide. “We wanted to create an open source tool that is so intuitive that anyone can use it,” adds Bieg. “They can simply modify the tool for their own needs and it will really help their work.”

Online Mapping Solutions’ Fordyce engineered the application so that it is easily customizable. “The idea was to provide an application with a basic set of GIS tools for the urban forest community. The application is scalable, so that urban forest departments and organizations can add their own tools to suit specific needs,” explains Fordyce. “As the library of urban forest management tools grows, users can share information throughout the urban forestry and geospatial open source communities. We hope that this open sharing will result in a robust and full-functionality urban forest management application. The open source development strategy provides many possibilities for all types of organizations.”

Looking Into the Future

Bieg and Braswell have an even broader plan for the project. They hope to arm FUF volunteers and youth program members with wireless handheld computers and send them into the field to update data from a tree’s site, sending a photo and confirming its exact location. Not only will this keep the databases up-to-date, but it will give at-risk and low-income youth marketable skills in geospatial information systems, data analysis, and urban forest management. And, it will give them a paycheck as they learn.

To Learn More

To learn more about the San Francisco Urban Forest Mapping Project, visit www.urbanforestmap.org.

To learn more about how MapGuide Open Source is helping organizations quickly develop and deploy Web-mapping applications and geospatial Web services, visit www.autodesk.com/mapguide.