
Development Scenarios

◀ SUMMARY ▶



FLAGSTAFF REGIONAL Plan 2012



MARCH 2012



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► Introduction

Arizona Growing Smarter statutes (A.R.S. 9-461.05) require updates to general and comprehensive plans a minimum of every 10 years. The Flagstaff Area Regional Plan 2012 (Regional Plan) will update the existing Flagstaff Area Regional Land Use and Transportation Plan (November 2001).

While the Regional Plan will meet A.R.S. requirements for all mandated plan elements, a goal of the City of Flagstaff (City), Coconino County, and the Flagstaff Metropolitan Planning Organization (FMPO) is to incorporate “livability principles” that are broadly supported by the community, including the integration of transportation, urban form, and economic development. The Regional Plan will lead to a sustainable land-use and development pattern, and a context-sensitive and efficient multimodal transportation system that supports economic development, improved safety, and accessibility.

The Regional Plan will establish a vision and guide the City of Flagstaff, Coconino County, and FMPO to developing and implementing the policies, improvements, and priorities of the community to make the area an attractive place for residents to live and businesses to prosper.

The Regional Plan is following a regional visioning and scenario-based planning process that facilitates analysis of, and public input on, scenarios that exemplify differences in how the region could grow over the coming decades. Each of the scenarios reflect differences in land use, density and open space, and the transportation network. A scenario approach to Plan development

enables an assessment of the relationship between land use choices and transportation and other outcomes, and provides residents, business leaders, and elected officials the opportunity to explore and debate the regional growth visions, their tradeoffs, and alternative futures. The analysis conducted for the four scenarios will be used to form transportation goals for the Transportation/Circulation element of the Regional Plan. The scenario analysis will contribute to the formation of the policies and discussions related to building and maintaining roadway and transit facilities.

Scenario planning is used in comprehensive planning to assist in identifying regional goals and community values, as well as exploring alternatives for growth, development, and transportation investments in and around Flagstaff.

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CommunityViz, a GIS-based software program, was used to develop and analyze the scenarios. As part of the process for developing the scenarios, two phases of analysis were conducted. The first phase consisted of three scenarios and a set of indicators, or outputs, based on the development



patterns within each scenario. The second phase of analysis added a scenario and removed a scenario, which will be described in greater detail in the report, as well as added to the list of indicators that were to be analyzed. Each phase of analysis was presented to the City and County staff, as well as the Citizen Advisory Committee (CAC), which is a group of representatives from the community. Based on the goals of the Regional Plan, and the types of indicators, scenarios were added and removed to provide more development options and a greater detail of analysis. This document is organized around each of the phases of analysis, where each phase is presented and discussed separately.

The purpose of this document, Development Scenario Summary, is to inform stakeholders about the planning process and to describe the alternative development scenarios being considered for the Flagstaff region. This document serves as guidance for determining goals, policies, and development standards for the Transportation/Circulation element of the Regional Plan. In addition it will act as a resource to stakeholder groups as they contemplate the region's future, and select a preferred development scenario that meets community-stated initiatives to link development with quality of life and improve community cohesiveness and supporting infrastructure.

Scenario planning provides a forum, process, set of tools, and measurable outcomes for the region to contemplate future possibilities. Development scenarios prepared for the region are fictional stories about the future—they are not forecasts or predictions. They are possible future outcomes that

might come to pass based on what already exists, on trends that are evident, or on regional goals and community values stated during the study. The essential requirement of any development scenario is that it be plausible, within the realm of what exists or what could be. Scenario planning also allows the community to measure results and evaluate the trade-offs associated with competing development scenarios. This ability provides stakeholders with an opportunity to identify and discuss strengths and weaknesses associated with the various development scenarios, and enables more informed decision-making for formulating the region's preferred development scenarios prepared for the Flagstaff Comprehensive Plan that are summarized in this document.

SCENARIO DEVELOPMENT PROCESS

Scenario development is an integrative process that involves City and County staff, regional stakeholders, and citizens. It is important that the development scenarios reflect the issues that are experienced in the Flagstaff area such as transportation, preserving natural and wildlife corridors, and water usage. The project team, along with the Citizen Advisory Committee (CAC), worked with citizens and several working groups to understand the challenges and opportunities facing the region and help create the three alternative development scenarios.

STAKEHOLDER AND CITIZEN INPUT

The project team facilitated several citizen workshops in a charrette format from July 14 – 22, 2011 to capture community values and attitudes toward growth in the region. At each event, a brief



presentation by the project team was followed by a hands-on, table-top exercise (i.e., development chip game in the following section) on maps used to idealize three different growth scenarios that could be possible in the Flagstaff region. Groups worked together to identify general development themes and to place new growth in areas of the region most suited for new development or redevelopment. The project team collected the maps at the end of each event for the purpose of building the three alternative development scenarios. These maps were then used to determine the collective development goals for each scenario.

DEVELOPMENT CHIP GAME

The scenario development chip game used in the community workshops involved using place type chips or stickers that represent a future population and employment growth outlook for a population of 150,000. Identified here within each scenario is a different distribution of place types or chips. It is possible that in the future, the population and employment of Flagstaff could increase by 70,000 people and up to 37,000 jobs. This population and employment change, also known as the “control totals,” are the same for each scenario which allows each scenario to be compared equally as the growth allocation is distributed uniquely. Totals are based on an assessment of zoned and planned permitted growth, water capacity assumptions, and projections.

► Phase 1 Analysis

PLACE TYPES

The analysis for Phase 1 included 12 place types, which were included in the development chip game, and are described below.



RURAL NEIGHBORHOODS/ MOUNTAIN ESTATES (RN/ME) –

Predominantly single-family housing on the urban fringe. Livestock and horses are permitted and they are typically abutting National Forest lands. Most of the natural features are retained and public services are not required such as water and sewer. There are no industrial uses present in this place type and limited commercial activity is present as a result of the limited population density.



SUBURBAN NEIGHBORHOODS (SN) – Predominant housing type is single-family home; however there are areas of mixed housing type such as duplexes, townhomes, low-rise apartments, and manufactured homes. Neighborhood shopping and services are present along with religious and education institutions, such as churches and schools. Typical city services are available such as water, sewer service, and recreation facilities.



URBAN NEIGHBORHOODS (UN) – Consists of small block, mixed-use, walkable neighborhoods with housing types that include townhomes and apartments/condominiums. Neighborhood shopping and services are present along with religious and educational institutions, such as churches and schools. Typical City services are available such as water, sewer service, and recreation facilities.

¹ Population and employment projections for this scenario development process were based on a population of 150,000 and 75,000 amount of employment. The year for reach this growth is not identified.



INDUSTRIAL BUSINESS INSTITUTIONAL PARK – This place type involves a variety of work places that include light industrial, research and development, offices, institutions, secondary processing of materials, finished product assembly, transportation, and wholesale/warehouse. This place type can also have heavy industrial which includes hazardous uses which can be offensive or unsightly.



COMMERCIAL CORRIDOR (CC) – All the commercial and service uses that serve the needs of the entire region, which include tourism and travel related businesses. This place type tends to be auto-oriented and the businesses and services serve the day-to-day needs of the surrounding neighborhoods.



URBAN CENTER (UC) – Provides services to residents and visitors beyond the immediate area and has twice the number of jobs as typical commercial locations. This place type is the center for government, business, institution, and places for culture and entertainment. This place type is accessible by all modes of travel.



REGIONAL CENTER (RC) – Provides services to residents and visitors beyond the immediate area and is accessible to multiple modes of travel such as cars, transit, pedestrians, and cyclists.



NEIGHBORHOOD CENTER (NC) – Provides services to local residents and pass-by traffic and includes a proportion of housing in the form of townhomes and apartments. This place type is accessible by all modes of travel.

To display mixed-use land uses, participants were instructed to layer chips upon each other. As a result, to accurately represent the mixing of these land use concepts in the model, two new mixed-use place types were added—suburban mixed-use and urban mixed-use. In addition, participants placed “Industrial, Business Park, and Institutional” chips during the workshop to represent future service, and industrial and institutional jobs in the region. In the CommunityVIZ scenario planning process, this place type was split into three separate place types: Business Park, Industrial-Heavy, and Institutional to differentiate between the three separate employment types in the model. Below are more detailed descriptions of each of the additional place types used in the CommunityVIZ model.

BUSINESS PARK (BP) – This place type includes office uses that are mostly included in the service industry classification and light industrial.



INDUSTRIAL-HEAVY (IH) – Provides a distribution of future uses that can include hazardous uses which can be offensive or unsightly.

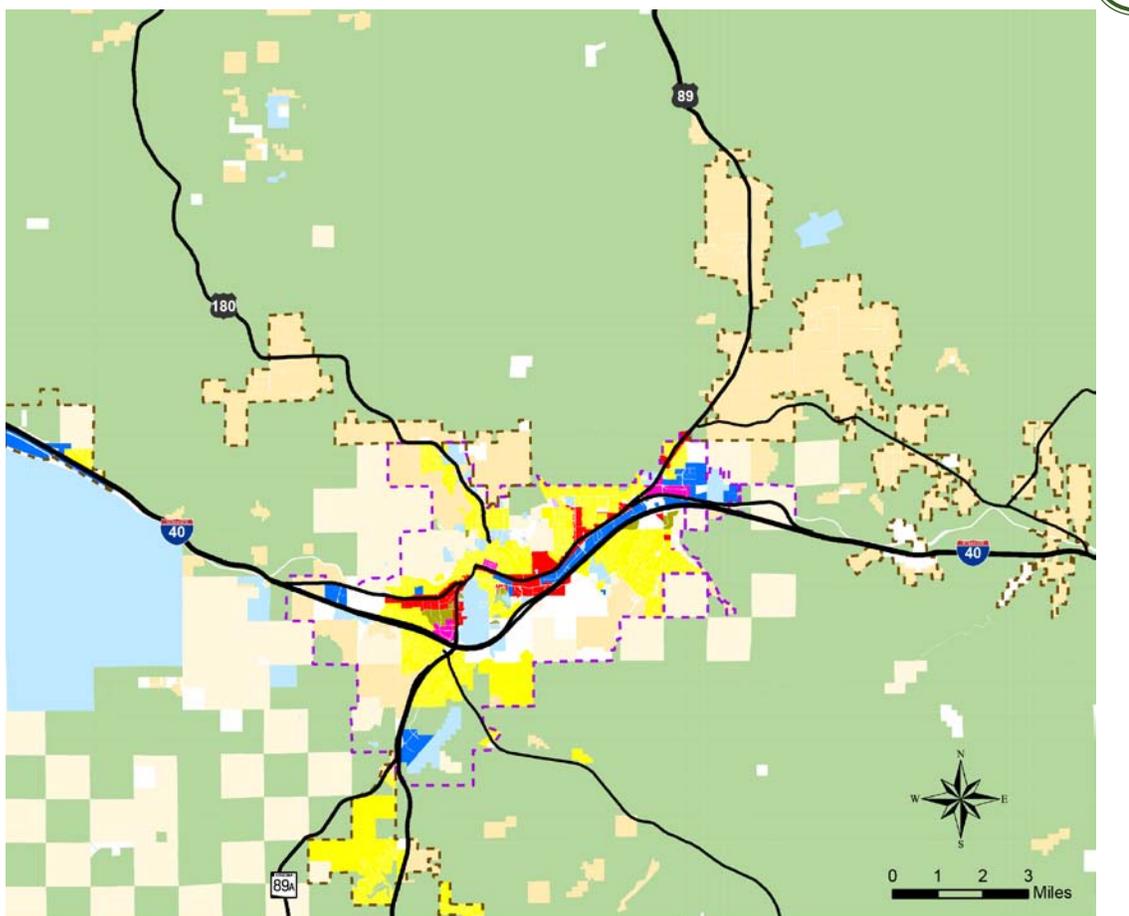
INSTITUTIONAL (INS) – All government, educational, and even large-scale religious campus development would be considered institutional.

SUBURBAN MIXED-USE (SMU) – This provides a mix of land uses and housing types in more periphery locations of the city with lower densities than found in the center city. These areas can be conducive to multimodal transportation techniques and walkable neighborhoods.

URBAN MIXED-USE (UMU) – Much like Suburban Mixed-Use, there is a variety of housing types and land use types, however they are found in more dense locations of the city that have access to frequent transit, regional bike networks and higher job concentrations.

To place the changes in each scenario in context, a map showing existing land uses is provided below.

EXISTING LAND USES



Legend

Rural Growth Boundary	Existing Land Uses	UN	CC	Protected Open Space
Urban Growth Boundary	RN/ME	INS	RC	Unprotected Open Space
	SN	BP	NC	

DEVELOPMENT SCENARIO SUMMARIES

The project team prepared three development scenarios for the Flagstaff Regional Plan 2012 using general themes developed in the planning process and other information volunteered by partnering groups. Each scenario was different enough to pose real choices for how the region could develop under one or more planning initiatives. The three development scenarios are:

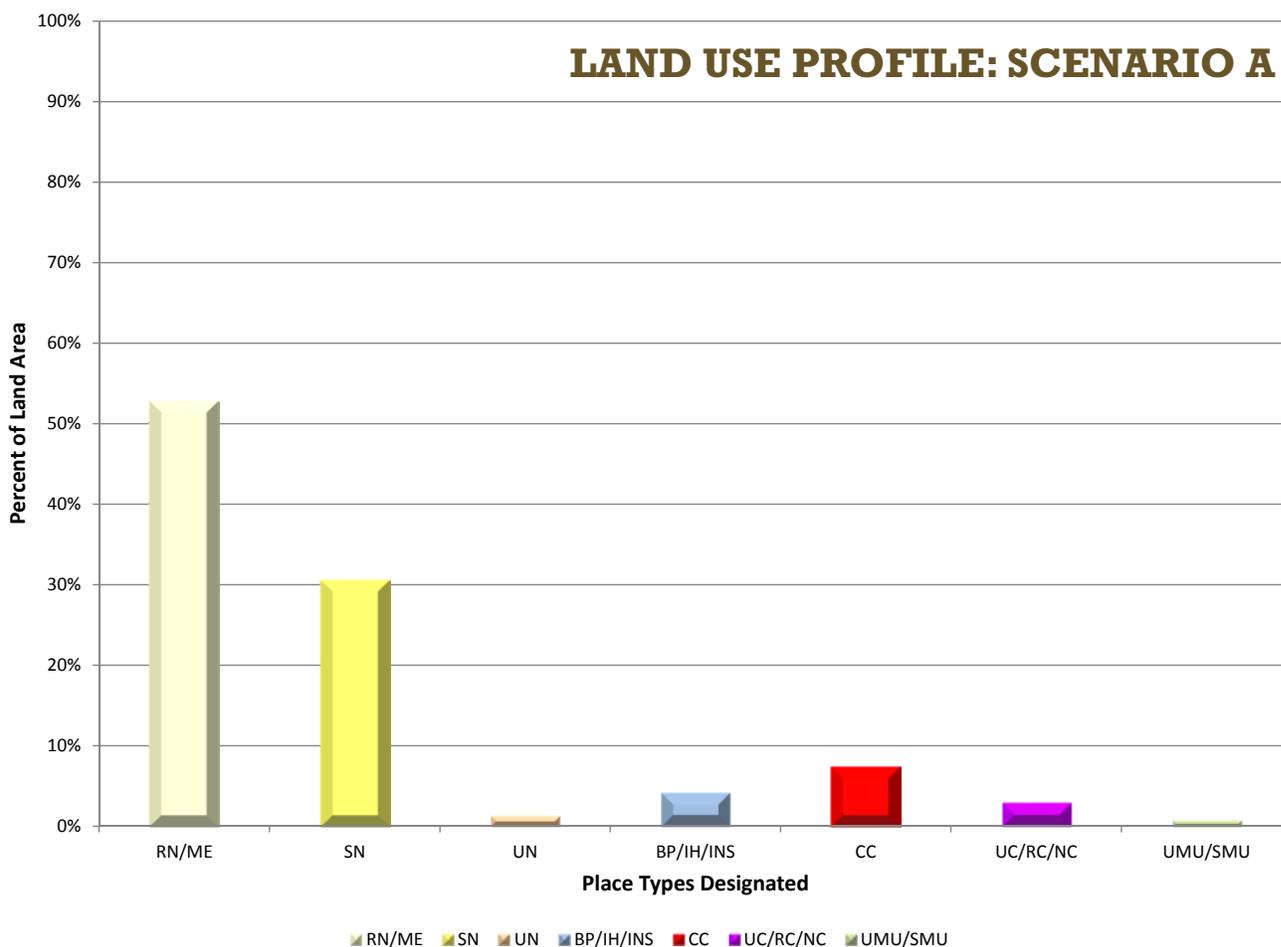
Scenario A: Growing Out

Scenario A identifies how the region will look if development occurs in a dispersed pattern of development that is similar to what is currently seen in Flagstaff. The development pattern under this scenario is reflective of the goals of the 2001 Regional Plan (which this Regional Plan is updating).

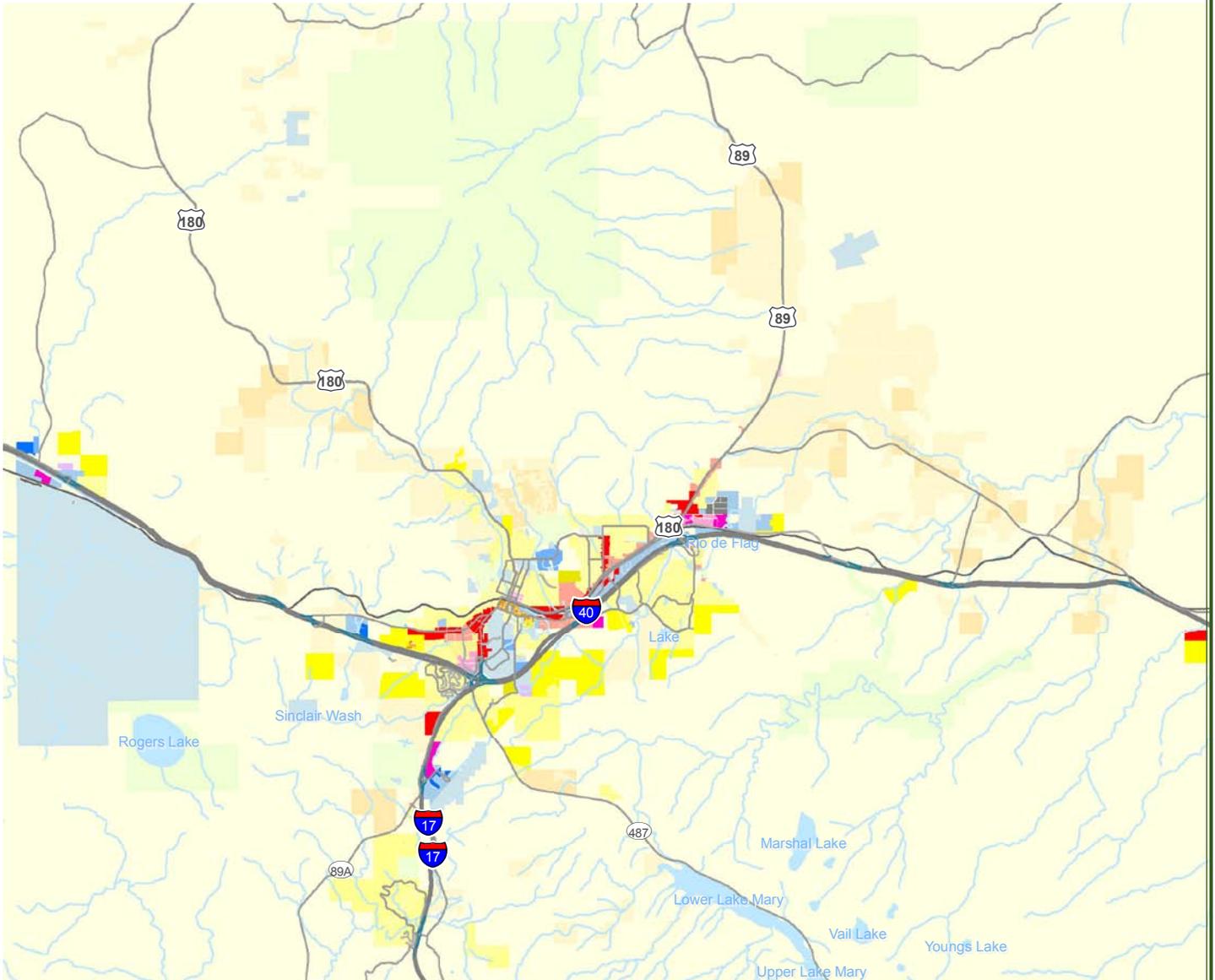
New growth would largely take the form of single-use, low-density development that is generally isolated and automobile-oriented.

Common features of Scenario A include: green field development patterns, outward expansion of public utilities, and transportation investments that favor the automobile over other modes of travel such as transit, walking, and biking. Place types and the distributions of the place types follow closely the existing pattern of development found currently in the Flagstaff region.

SCENARIO A	
Population	70,873
Avg. Residential Density	3.10
Employment	37,204
Avg. Non-Residential Density	0.29



SCENARIO A + EXISTING LAND USES MAP



Legend

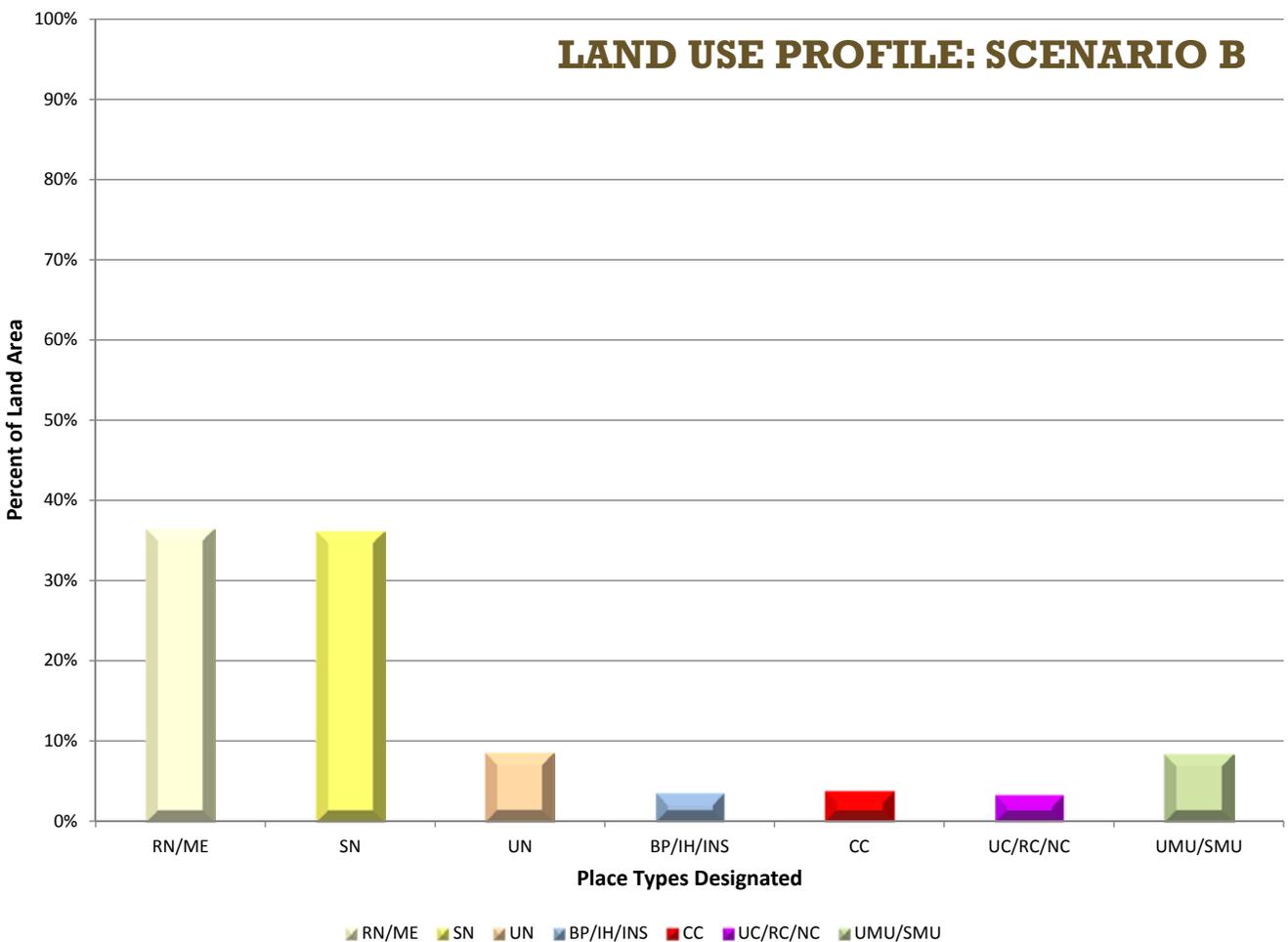
 Rural/Mountain Estates	 Industrial - Heavy	 Urban Mixed-Use
 Suburban Neighborhood	 Commercial Corridor	 Suburban Mixed-Use
 Urban Neighborhood	 Urban Center	 Open Space - Protected
 Institutional	 Regional Center	 Open Space - Unprotected
 Business Park	 Neighborhood Center	

Scenario B: Growing In and Out

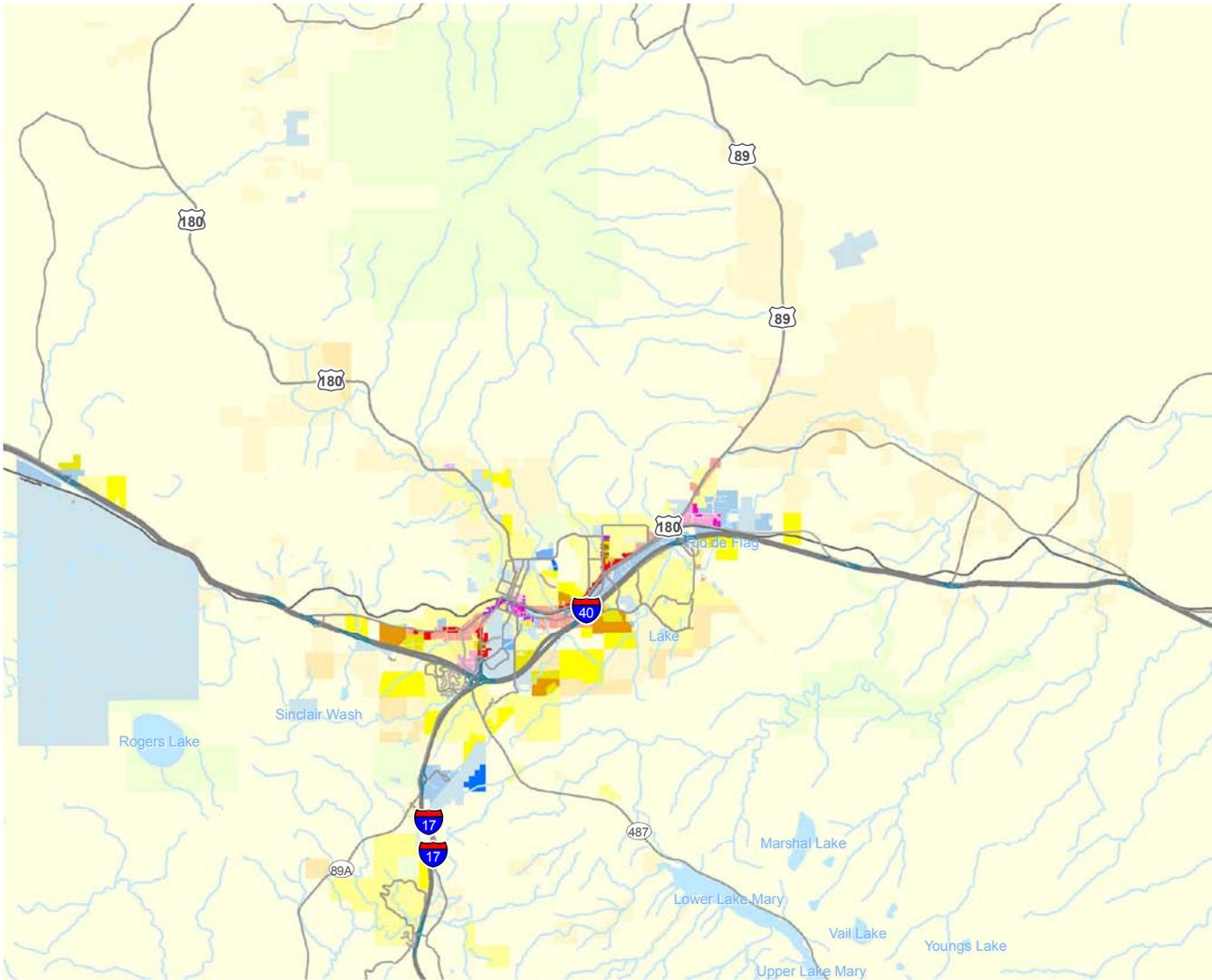
Scenario B identifies how the region will look with increased emphasis on higher-density housing types than what is currently found in Flagstaff, allowing for changes to transportation patterns and access to jobs. The development pattern under this scenario is reflective of the goals of the new Regional Plan (which is updating the 2001 Regional Plan). New growth would still consist primarily of single-use, low-density development; however, an increased supply of mixed-use and higher-density housing and employment will allow for more walkable communities and alternative modes of travel.

Common features of the scenario include: green field development patterns with an increase in infill development, reduced expansion of public utilities, and transportation investments that begin focusing on other modes while still giving the automobile the majority of infrastructure funding. New place types and land use concepts are introduced in the scenario, such as vertical mixed-use development in areas of concentrated population and employment.

SCENARIO B	
Population	69,561
Avg. Residential Density	5.30
Employment	36,830
Avg. Non-Residential Density	0.39



SCENARIO B + EXISTING LAND USES MAP



Legend

 Rural/Mountain Estates	 Industrial - Heavy	 Urban Mixed-Use
 Suburban Neighborhood	 Commercial Corridor	 Suburban Mixed-Use
 Urban Neighborhood	 Urban Center	 Open Space - Protected
 Institutional	 Regional Center	 Open Space - Unprotected
 Business Park	 Neighborhood Center	

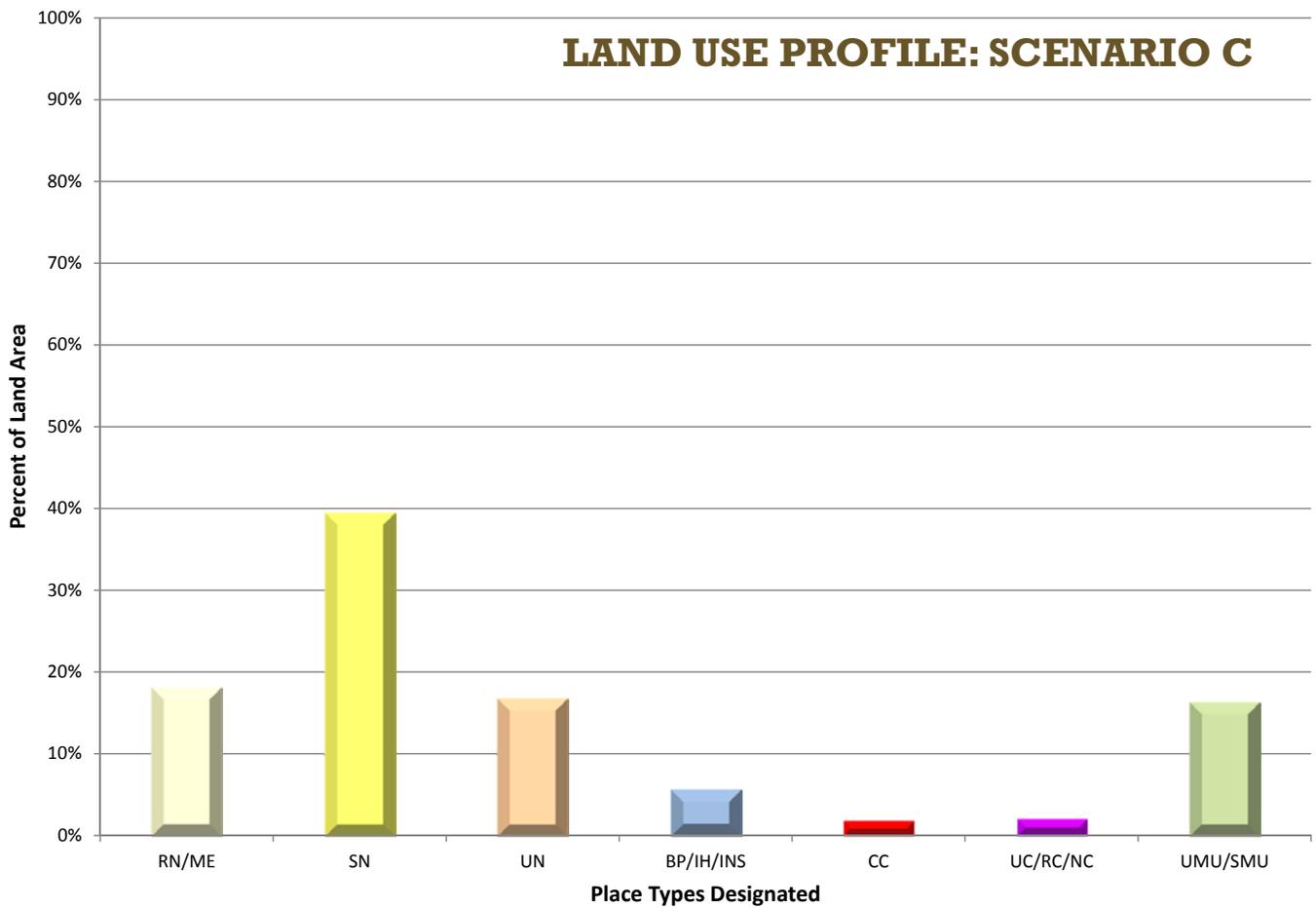
Scenario C: Growing In

Scenario C has even more high-density housing and employment opportunities, which limits the amount of land needed for new development and reduces the impact to both the transportation and public utility networks. Single-use development is still available but not at the same proportion available in Scenario A.

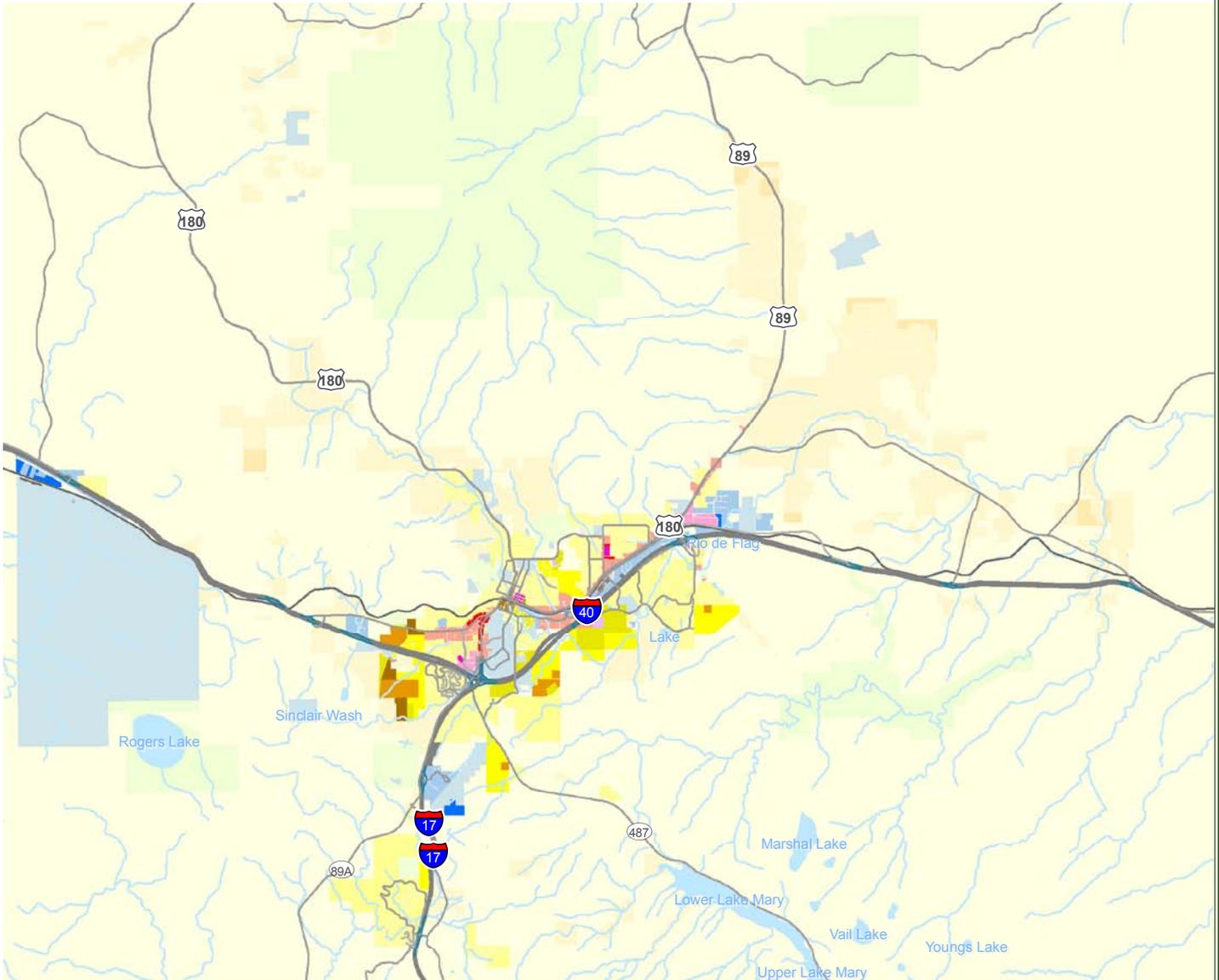
Common features of this development scenario include: concentrated development areas, land

preservation outside developed centers, a variety of development types and intensities, and more travel options (i.e. walking, bicycle, transit and automobile).

SCENARIO C	
Population	71,784
Avg. Residential Density	8.20
Employment	39,652
Avg. Non-Residential Density	0.43



SCENARIO C + EXISTING LAND USES MAP



Legend

 Rural/Mountain Estates	 Industrial - Heavy	 Urban Mixed-Use
 Suburban Neighborhood	 Commercial Corridor	 Suburban Mixed-Use
 Urban Neighborhood	 Urban Center	 Open Space - Protected
 Institutional	 Regional Center	 Open Space - Unprotected
 Business Park	 Neighborhood Center	

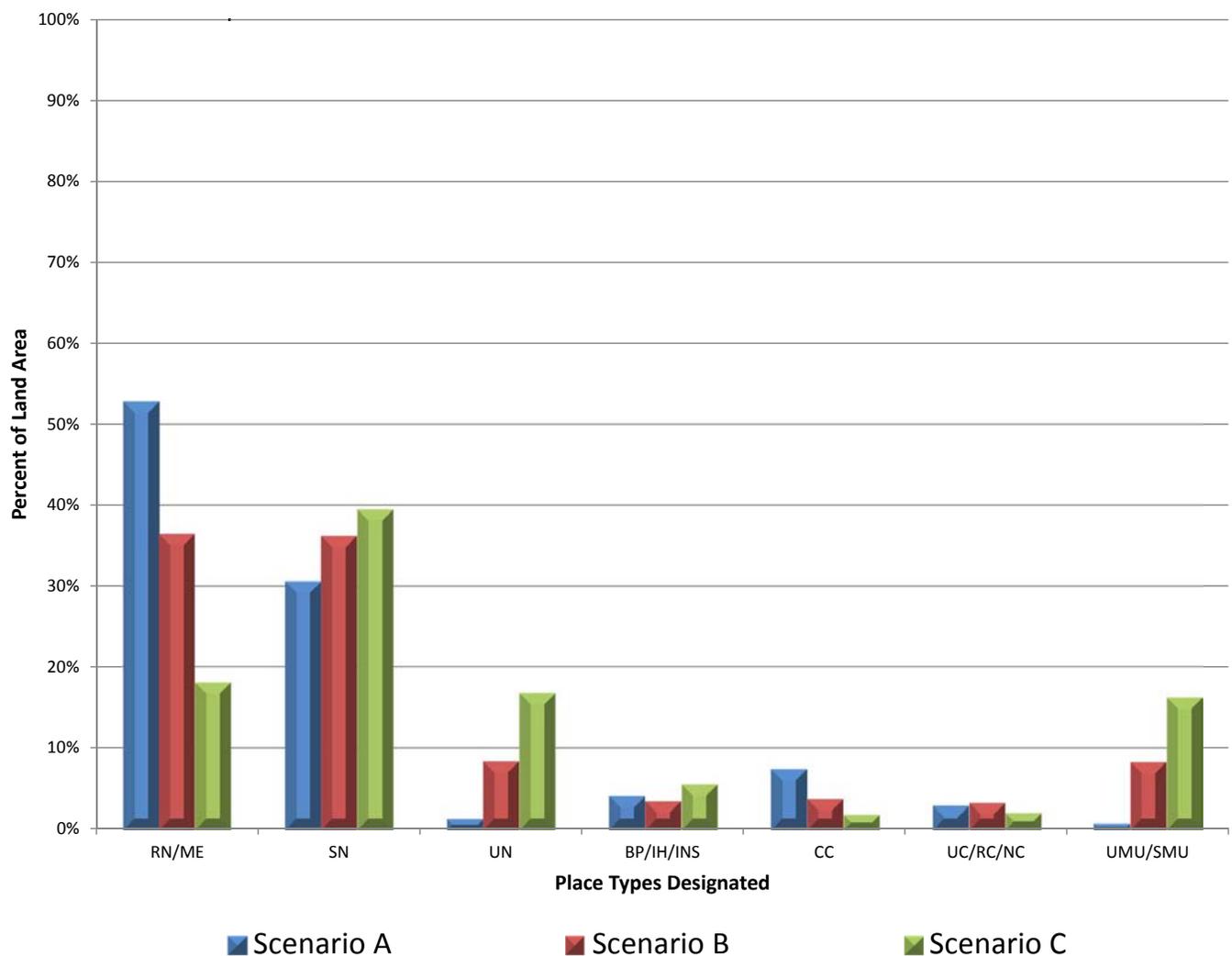
► Scenario Indicator Summaries

The project team refined general themes identified in the scenario development process and these themes have been summarized in the following section. Performance measures for each growth principle were created to quantify and explain the differences between the development scenarios. Summary statistics for comparing the output of performance measures for each regional growth principle were created using CommunityVIZ software.

Land Use

Overall, there are apparent land use differences between all of the scenarios. Rural living and mountain estates, which are prevalent in Scenario A, are limited and are replaced by an increased number of urban and mixed-use development types in Scenarios B and C. The addition of these new place types into the land use toolbox allows Flagstaff to adapt to some of the changes in national patterns of land use and transportation planning.

On the non-residential side of the land use discussion, we see below that the form of retail uses is moving from being located in the automobile-oriented ‘commercial corridor’ in Scenario A to be located in the mixed-use land use types in Scenarios B and C. This can have a dramatic effect in the look of our urban environments as this land use change occurs.

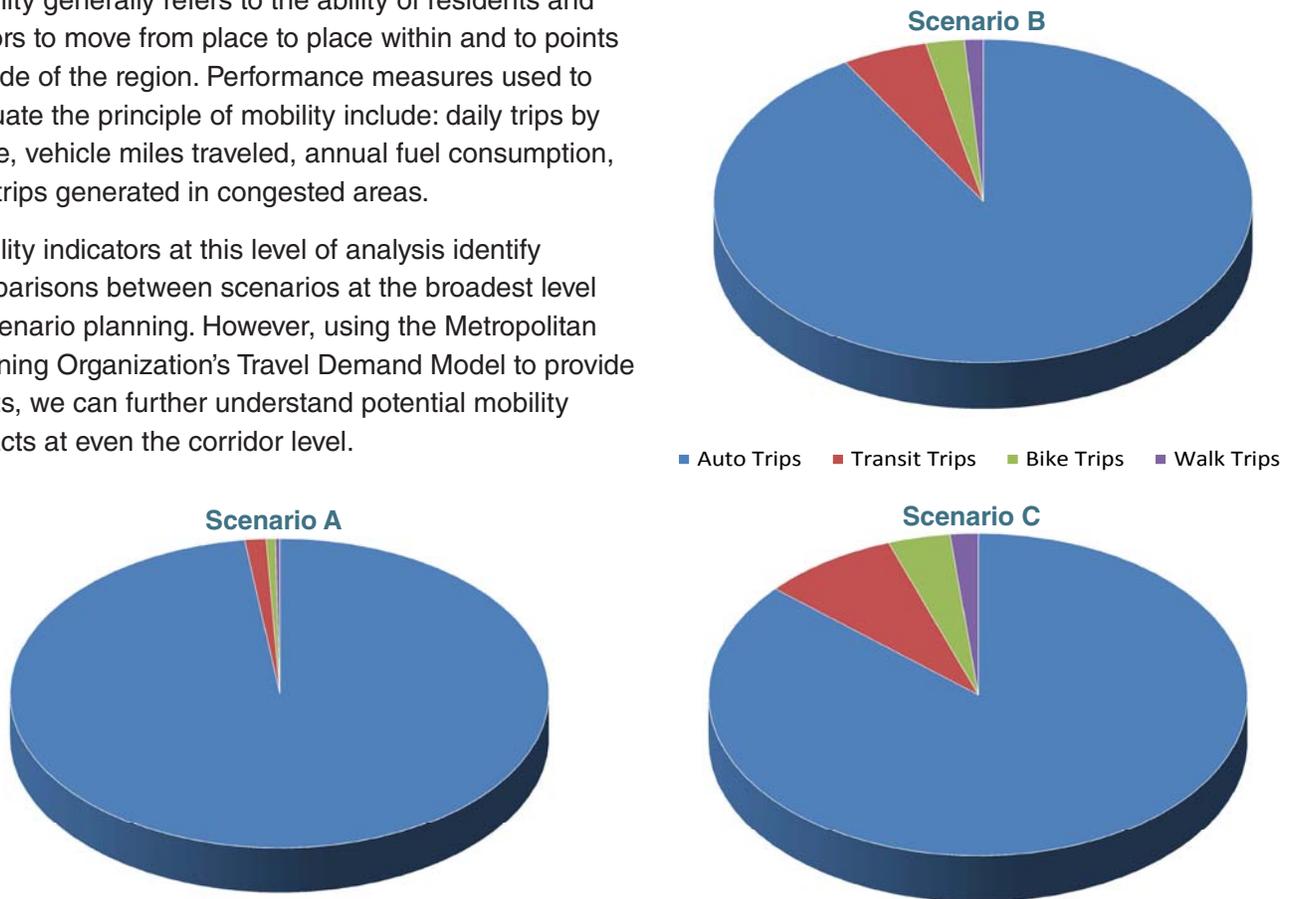


Mobility

Mobility generally refers to the ability of residents and visitors to move from place to place within and to points outside of the region. Performance measures used to evaluate the principle of mobility include: daily trips by mode, vehicle miles traveled, annual fuel consumption, and trips generated in congested areas.

Mobility indicators at this level of analysis identify comparisons between scenarios at the broadest level in scenario planning. However, using the Metropolitan Planning Organization's Travel Demand Model to provide inputs, we can further understand potential mobility impacts at even the corridor level.

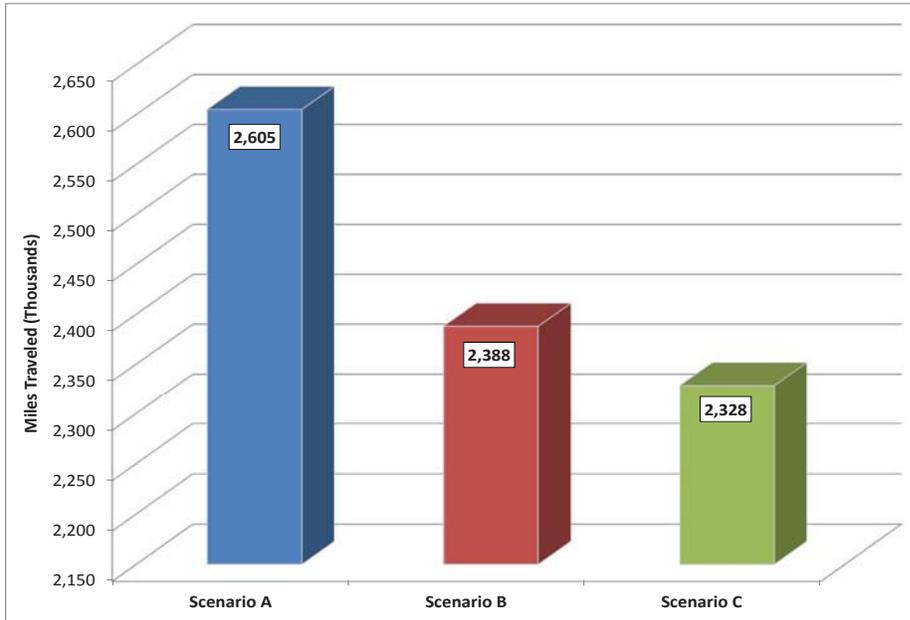
Daily Person Trips by Mode



As land use patterns shift from less dense to more dense in Scenarios A to C and as land use form changes from a more single-use to a mixed-use form, trip patterns begin to change. Increased desire to bike, walk, or take transit becomes apparent.

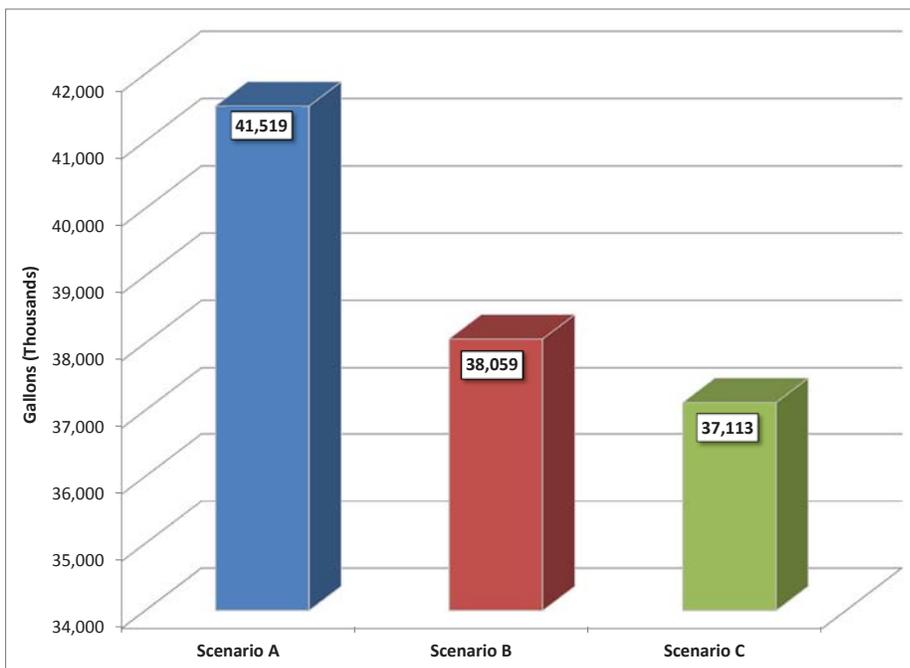
	SCENARIO A	SCENARIO B	SCENARIO C
PersonTrips Generated (Daily)	272,588	267,543	276,093
Auto Trips (Daily)	266,894	244,650	238,570
Transit Trips (Daily)	3,441	13,654	22,584
Bike Trips (Daily)	1,530	6,238	10,296
Walk Trips (Daily)	724	3,000	4,644

Vehicle Miles Traveled



As a larger proportion of new growth shifts from locating in more suburban areas to urban areas, the VMT of the people living in new development will be reduced as trip patterns change and traveled distance changes.

Fuel Consumption

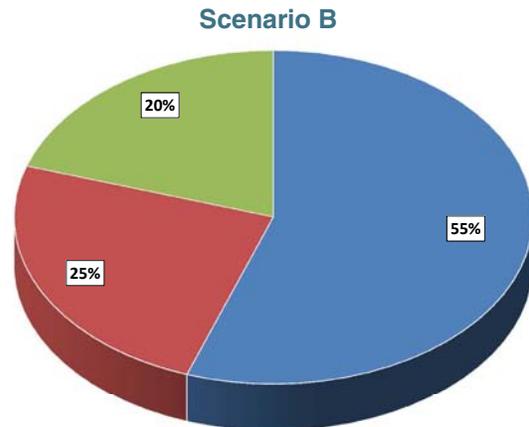
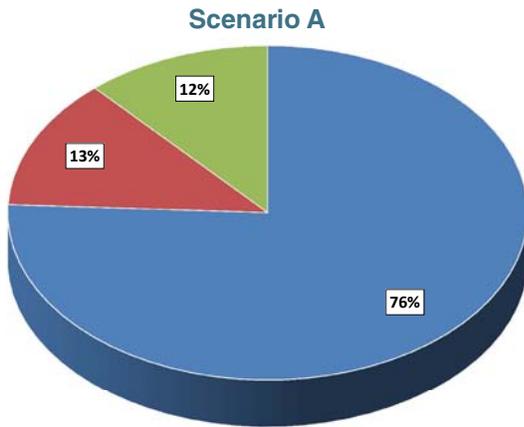


In Scenarios B and C, fuel consumption decreases as a result of fewer automobile trips and increased transit, bike, and pedestrians trips.

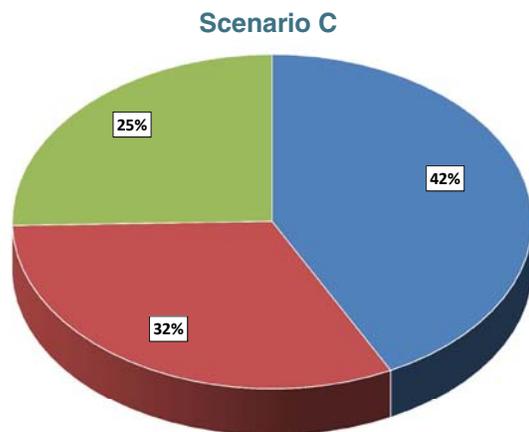


Housing Mix

A place to live versus a community are two very different concepts. Communities offer places for residents to live, work, and play. They also are distinguished by the physical and design characteristics of the buildings and neighborhoods they contain, and the social and qualitative aspects of human interaction that they nurture. Housing mix is the performance measure for this indicator.



■ Single Family ■ Multifamily - Apartment ■ Multifamily - Townhome

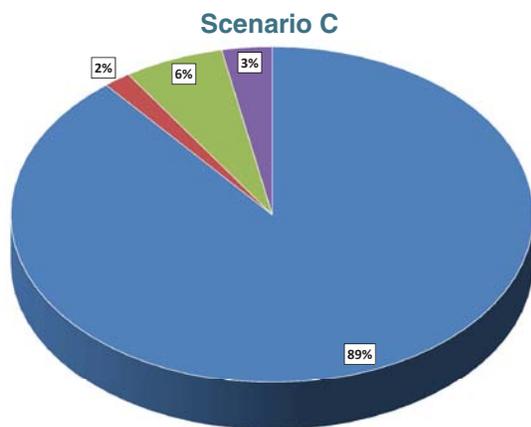
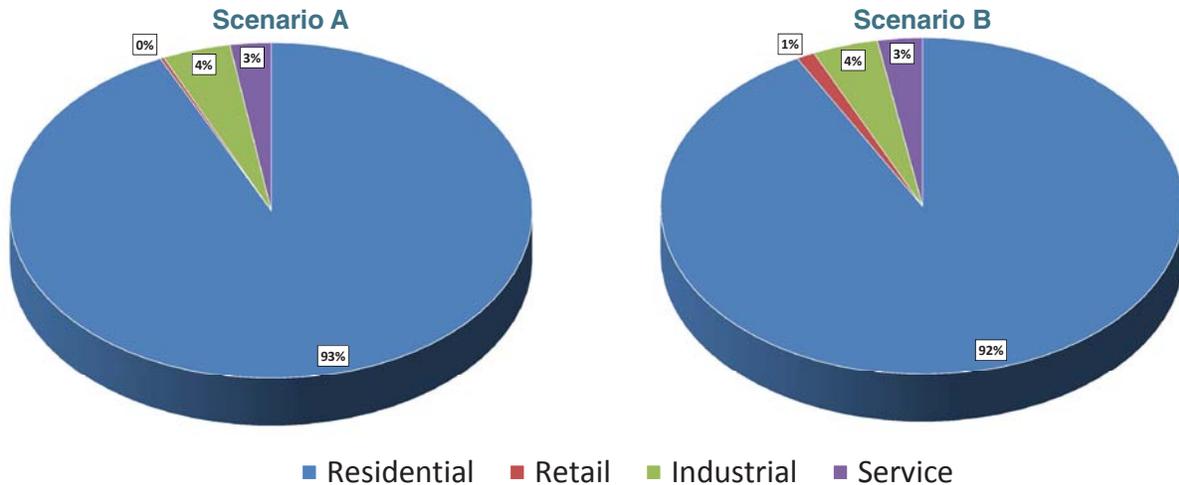


Diversity in housing mix is an important characteristic of cities. Housing mix can accommodate people of different incomes, household composition and age. Families may prefer single-family homes, while young single professional's may prefer apartments.

	SCENARIO A	SCENARIO B	SCENARIO C
Single Family	20,650	14,823	11,726
Multifamily - Apartment	3,449	6,565	8,871
Multifamily - Townhome	3,159	5,366	7,013
Total Households	27,259	26,754	27,609

Water Demand

In the Flagstaff area, water is an essential element that can either limit future growth or enable it. Preserving our precious resources, including water, is an important concept to compare when looking at future growth. As our communities develop, finding ways to preserve water is an important consideration as the scenario development process progresses.



	WATER USE RATES	GALLONS PER DAY
RESIDENTIAL HOUSEHOLDS	Rural Neighborhood/ Suburban Neighborhood	218/Household
	Urban Neighborhood/ Regional Center/ Neighborhood Center/Suburban Mixed-Use	174/Household
	Urban Center/Urban Mixed-Use	161/Household
NON-RESIDENTIAL USES	Retail	874/Acre
	Industrial	5497/Acre
	Office	874/Acre

For non-residential uses, water use rates do not change in the Flagstaff region, however for residential uses, water usage rates go down as development becomes more urban. Comparing rates among the scenarios, we can see that residential water use rates decrease from Scenarios A to C.

WATER USAGE	SCENARIO A	SCENARIO B	SCENARIO C
Daily Residential Water Demand (gallons)	5,833,682	5,390,394	5,337,704
Daily Retail Water Demand (gallons)	14,331	65,860	100,438
Daily Industrial Water Demand (gallons)	264,214	237,253	370,393
Daily Service Water Demand (gallons)	159,412	162,665	186,599
Daily Total Water Demand (gallons)	6,271,639	5,856,172	5,995,134

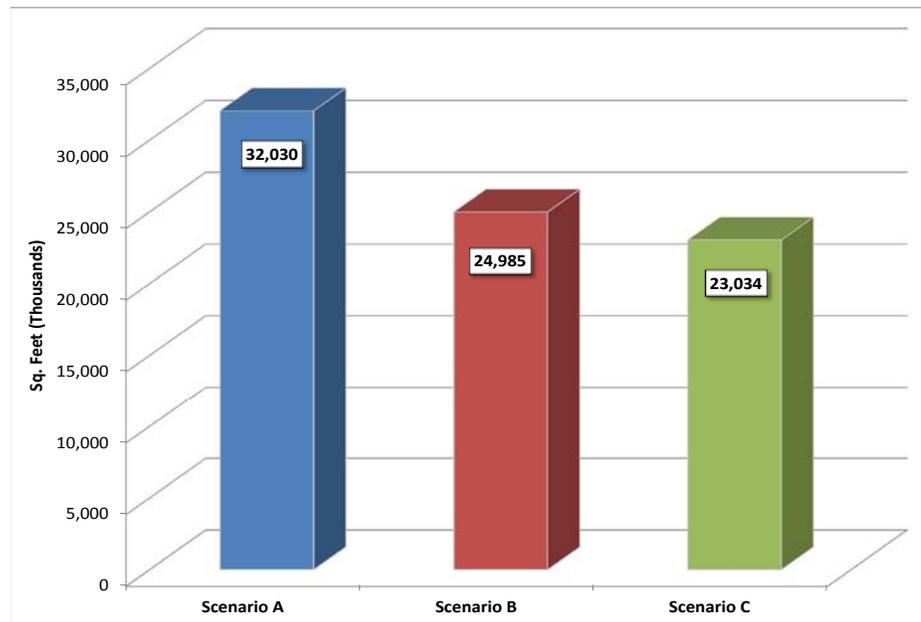


Environment

Environment is a broad category that includes the physical features of the region and the ability of policies and programs to protect certain environmentally-sensitive areas. Performance measures used to evaluate the principle of environment in Phase 1 include: building footprint and air quality emissions.

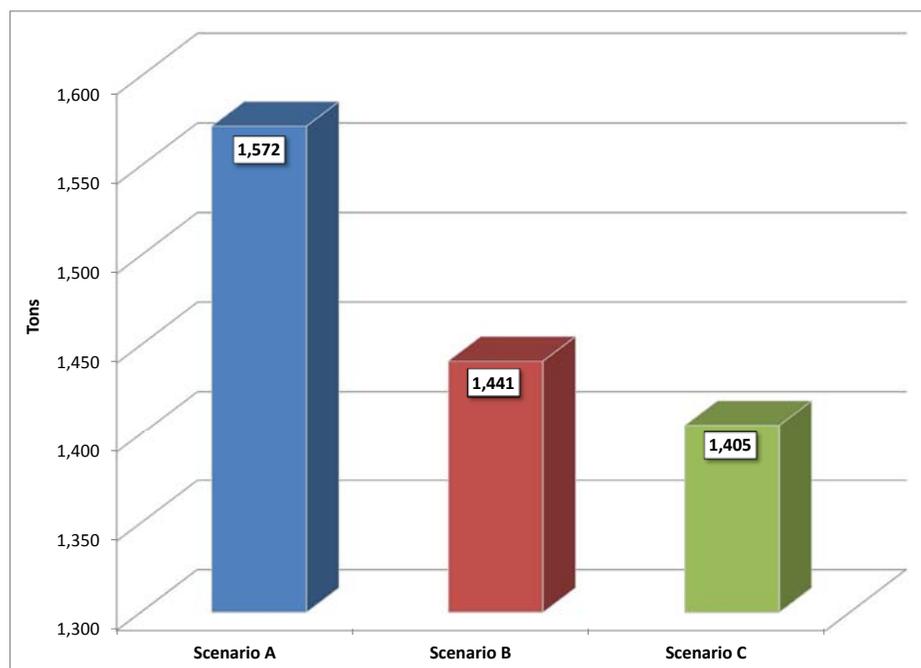
Building footprint indicates the amount of land that is needed to allow for the building to sit on, opposed to the development footprint which consists of the land and the building. The decrease in building footprint from A to C is associated with the higher residential and non-residential densities found in that latter scenarios.

Building Footprint

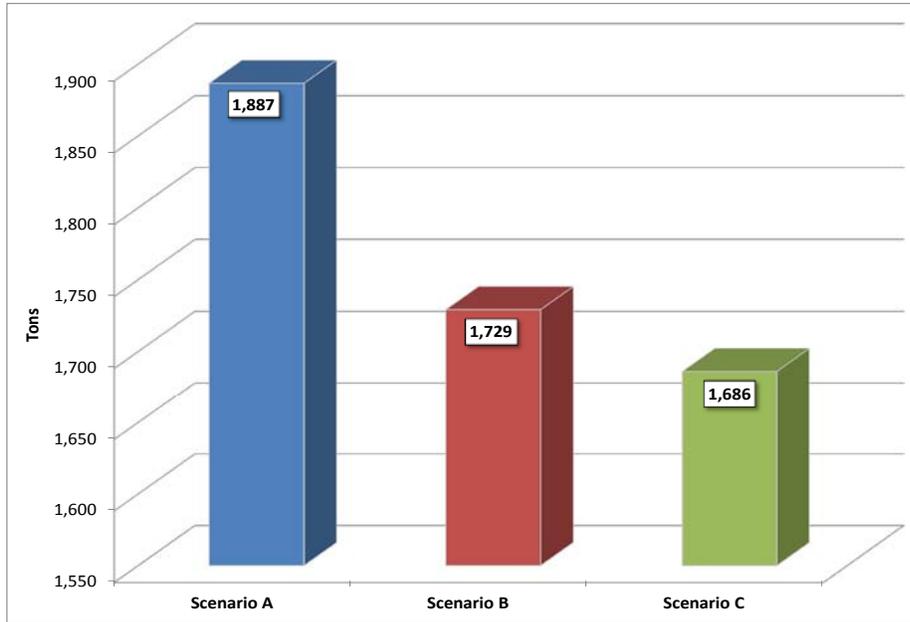


Nitrogen Oxides (NOx) is a collection of gases that are produced from cars, trucks and buses, power plants and off-road equipment. As the demand for the private automobile increases so will the amount of NOx that are produced in our region.

Annual NOx Emissions

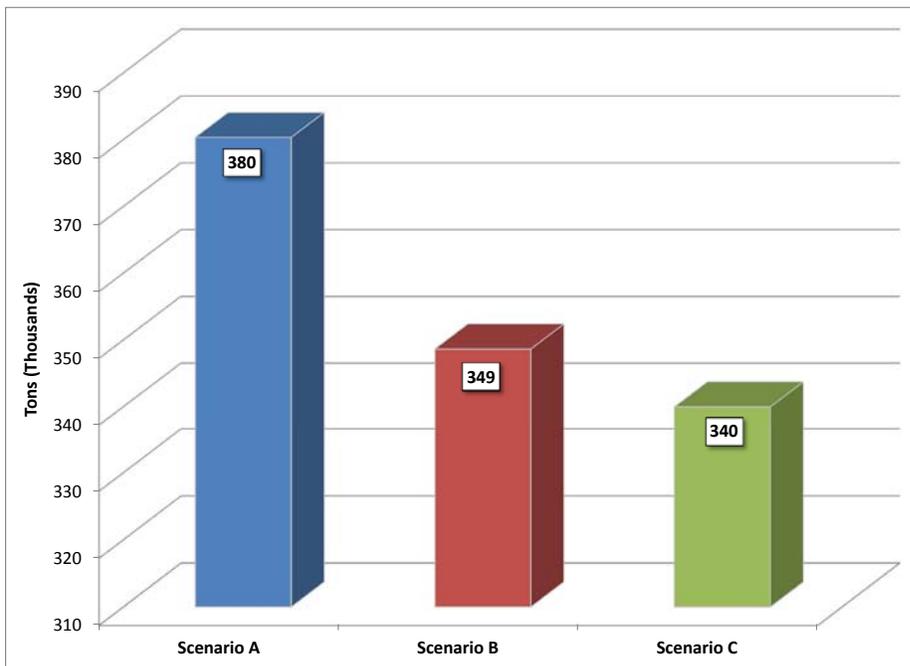


Annual VOC Emissions



Volatile Organic Compounds (VOC) also contribute to poor air quality in the region and lead to increased levels of ground-level ozone.

Annual CO2 Emissions



Carbon Dioxide (CO₂) is a naturally occurring gas produced in the earth's atmosphere. CO₂ concentrations have increased as a result of the increased burning of fossil fuels.



PHASE 1 CONCLUSION

Scenario development is a planning tool that allows citizens, elected officials, public administrators and other stakeholders the ability to compare future growth opportunities. Using CommunityVIZ® scenario software and the results gathered through the public input process the strengths and weaknesses of the three alternative growth scenarios were able to be analyzed. These alternatives ranged from a more typical growth pattern of single-family housing and automobile-oriented retail, to a more mixed-use growth pattern with increased demand for alternative modes of travel such as walking, biking and taking transit.

After a process to normalize densities and employment between the scenarios, it was discovered that Scenario C was too similar to Scenario B. The scenarios had to be different enough that they would determine policy differences. As a result, a new scenario was developed, Scenario D, for the second phase of analysis.



Phase 2 Analysis

The Phase 2 analysis included an additional scenario, two new place types, new indicators, and adjustments to previous indicators. The following section describes and illustrates the Phase 2 analysis.

PLACE TYPES

In addition to the 12 place types that were included in the Phase 1 analysis, two more place types were included for Phase 2. The two new place types are described below.



SUBURBAN NEIGHBORHOOD LIGHT (SNL) – This place type was included to reflect the actual style of suburban neighborhood development currently existing in Flagstaff. It consists mainly of lower-density single-family residential housing, however religious and educational institutions may be present. Typical city services are available such as water, sewer service, and recreation facilities.



METRO CORE (MC) – Provides services to residents in the Flagstaff Metropolitan Area and pass-by traffic and is accessible to multiple modes of travel. This is the most intense building place type.

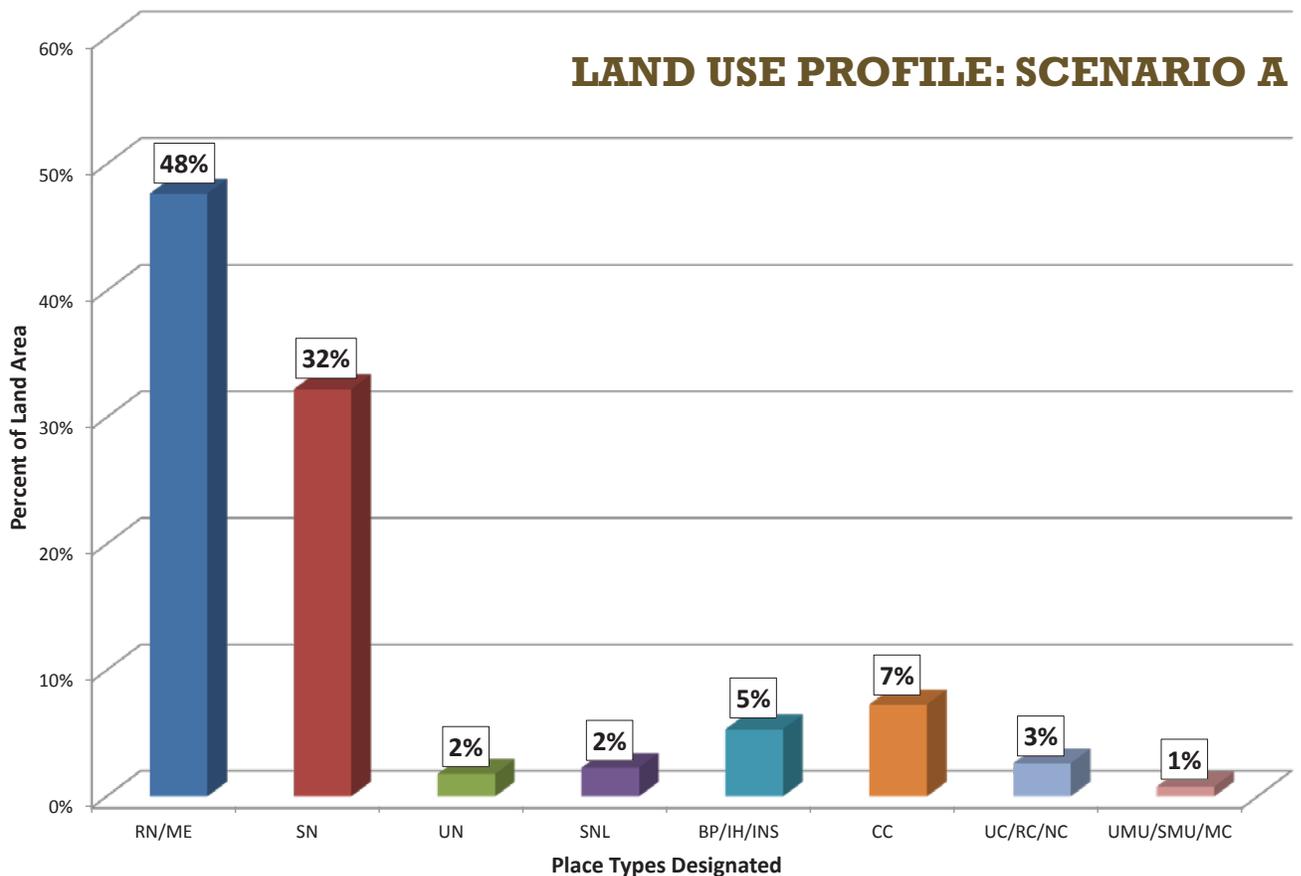
► Development Scenario Summaries

The Phase 2 analysis included the addition of Scenario D, as well as changes to Scenarios A and B. However, the general concepts behind A and B remain the same. Scenario C was not considered in the Phase 2 analysis because it was too similar to Scenario B to drive different policy decisions. It was assumed that the Northern Arizona University would reach its stated goal of 25,000 students, with a respective growth in employment at the institution. This change, along with other changes for normalization, is reflected in the following scenarios.

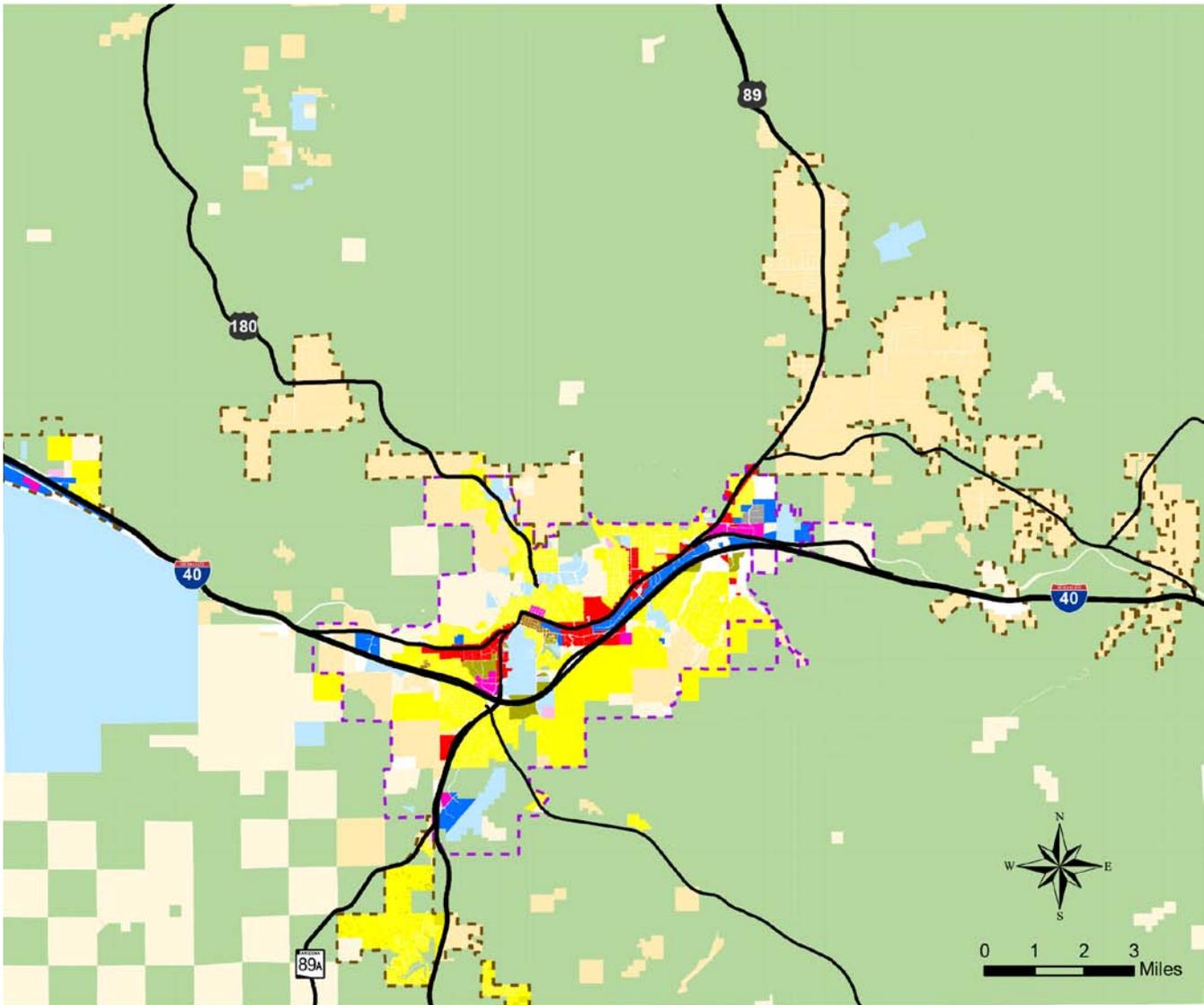
Scenario A: Growing Out

As stated for Phase 1, Scenario A identifies how the region will look if development occurs in a dispersed pattern of development that is similar to what is currently seen in Flagstaff. The development pattern under this scenario is reflective of the goals of the 2001 Regional Plan (which this Regional Plan is updating). New growth would largely take the form of single-use, low-density development that is generally isolated and automobile-oriented.

SCENARIO A	
Population	72,533
Avg. Residential Density	3.5
Employment	38,717
Avg. Non-Residential Density	0.30



SCENARIO A + LAND USE MAP



Legend

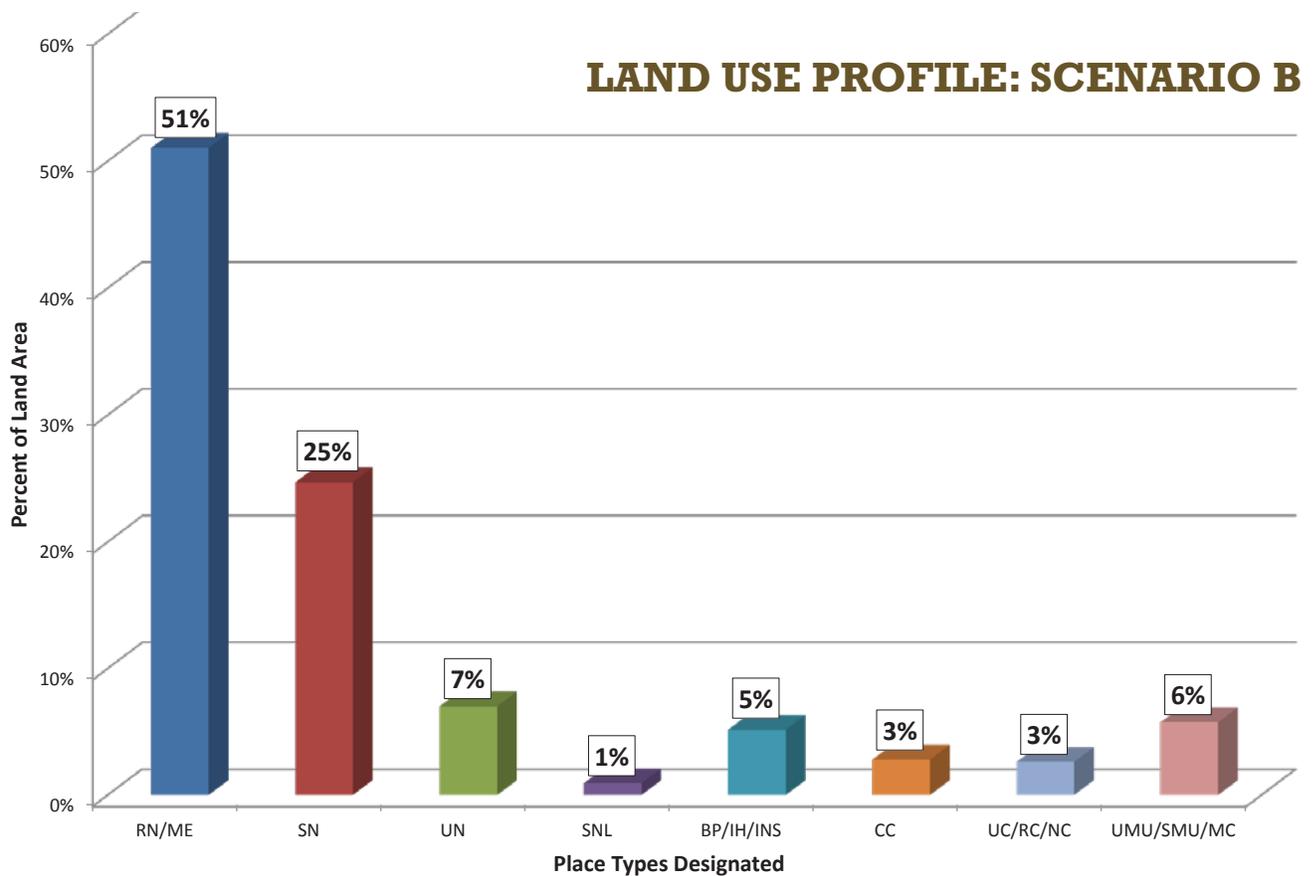
Rural Growth Boundary	SNL	INS	CC	NC	Protected Open Space
Urban Growth Boundary	SN	BP	UC	UMU	Unprotected Open Space
RN/ME	UN	IH	RC	SMU	

Scenario A has more growth on the perimeter of the Rural and Urban Growth Boundaries. In addition, there is very little mixed use development (UMU/SMU/MC). The resulting land use pattern under Scenario A is less conducive to supporting alternate modes of transportation, including transit, bicycling, and walking.

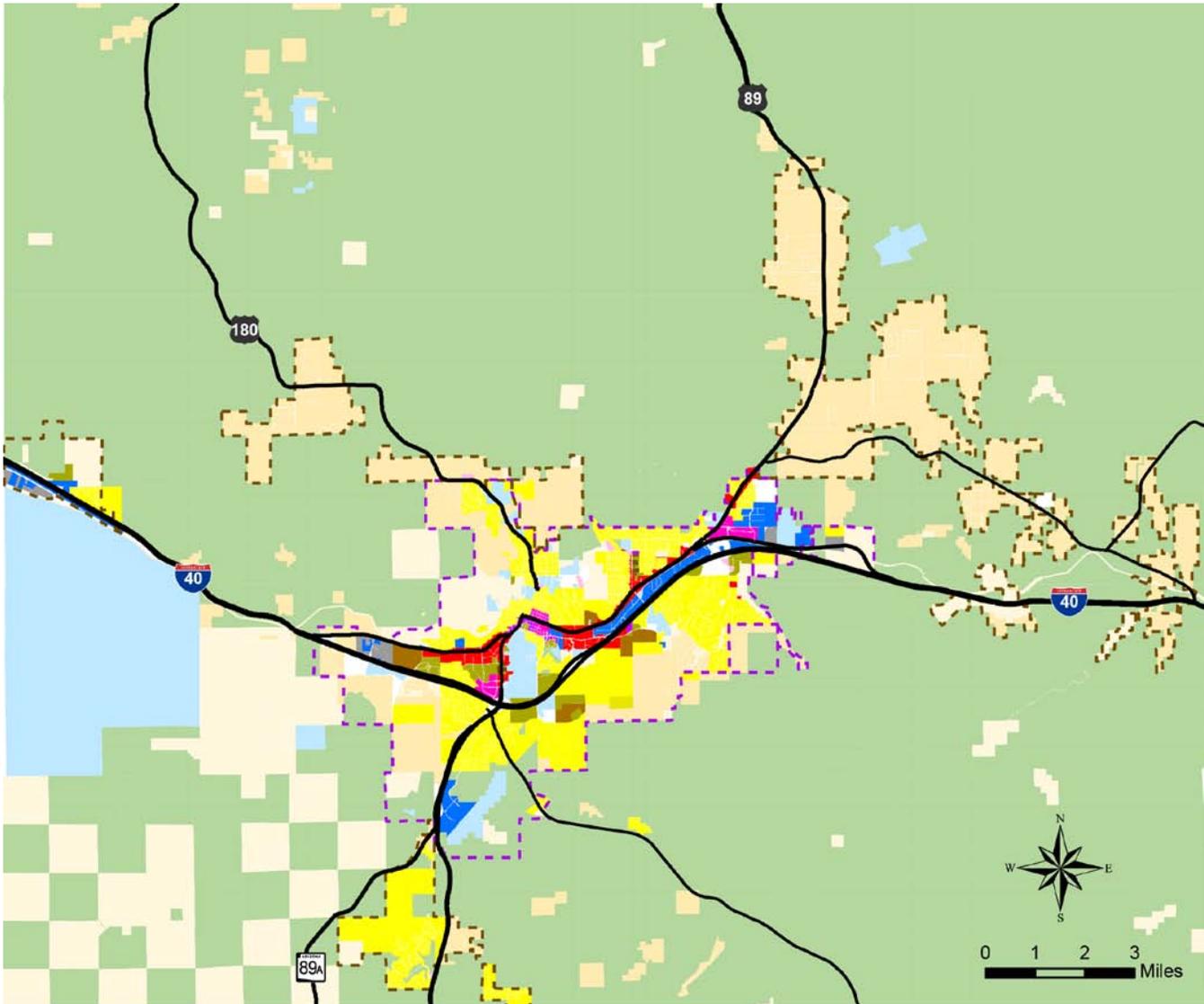
Scenario B: Growing In and Out

Scenario B identifies how the region will look with increased emphasis on higher-density housing types than what is currently found in Flagstaff, allowing for changes to transportation patterns and access to jobs. The development pattern under this scenario is reflective of the goals of the new Regional Plan (which is updating the 2001 Regional Plan). New growth would still consist primarily of single-use, low-density development; however, an increased supply of mixed-use and higher-density housing and employment will allow for more walkable communities and alternative modes of travel.

SCENARIO B	
Population	72,154
Avg. Residential Density	4.5
Employment	41,130
Avg. Non-Residential Density	0.35



SCENARIO B + LAND USE MAP



Legend

Rural Growth Boundary	SNL	INS	CC	NC	Protected Open Space
Urban Growth Boundary	SN	BP	UC	UMU	Unprotected Open Space
RN/ME	UN	IH	RC	SMU	

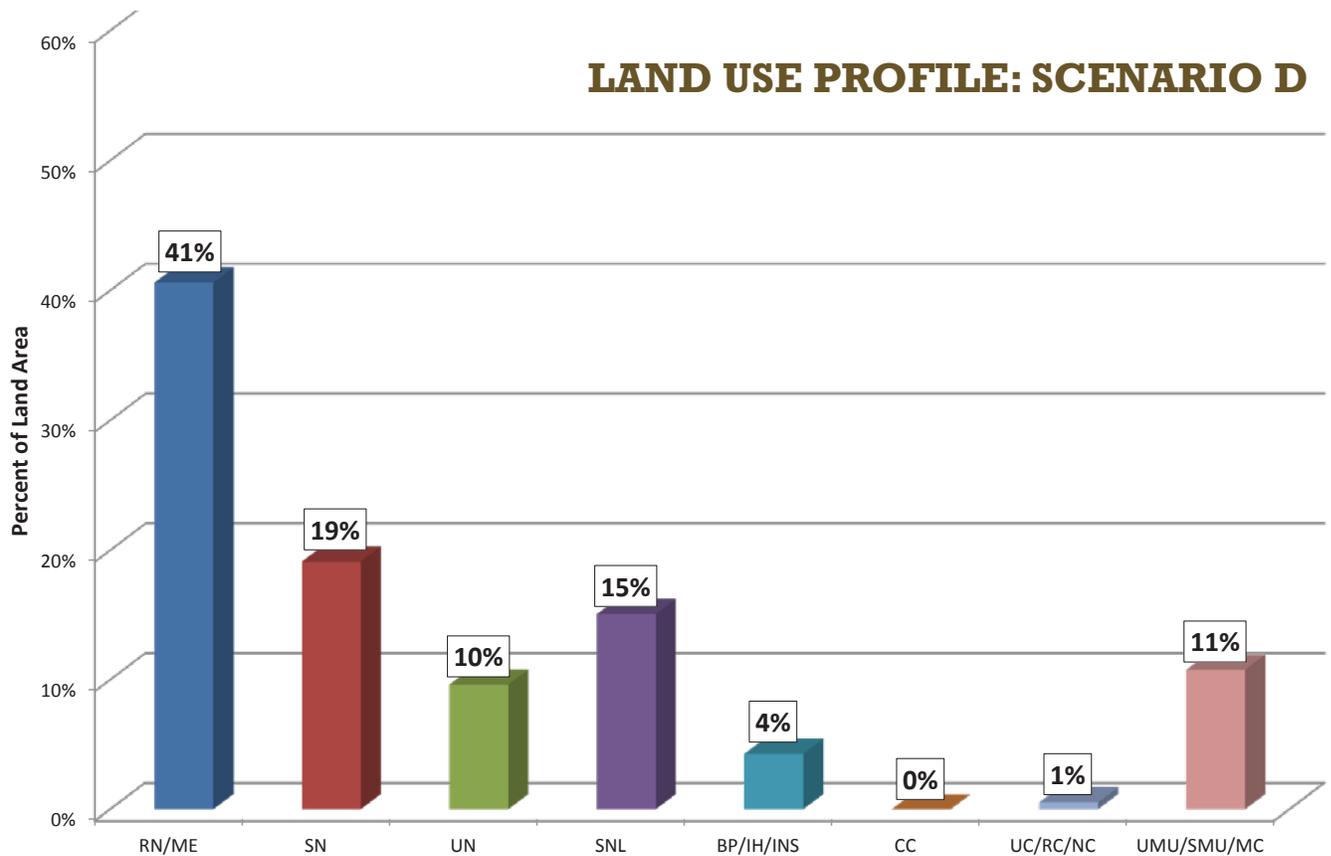
Scenario B has greater amounts of mixed use development (UMU/SMU/MC), located toward the heart of the City. Growth in general is directed more towards the center of the City. The resulting land use pattern under Scenario B is more likely to encourage the use of alternate modes of transportation.

Scenario D: Growing In

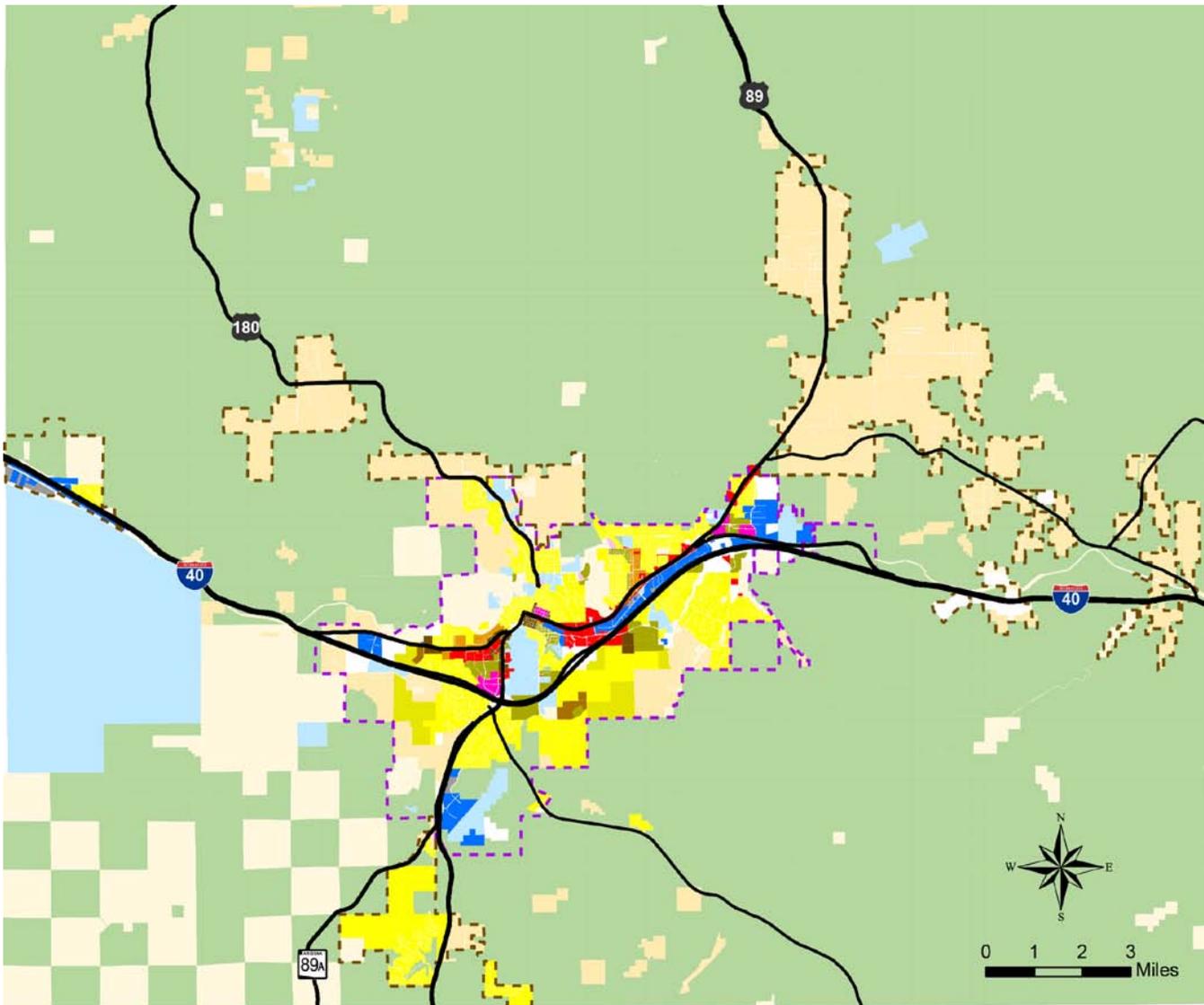
Scenario D was developed to represent a scenario with even more high-density housing and employment opportunities, thus preserving land on the fringe areas of the City. This scenario was developed to illustrate a higher density option to a greater degree than the previous Scenario C, which was developed during the Phase 1 analysis.

Common features of this development scenario include: concentrated development areas, land preservation outside developed centers, a variety of development types and intensities, and more travel options (i.e. walking, bicycle, transit and automobile).

SCENARIO D	
Population	71,598
Avg. Residential Density	5.5
Employment	39,689
Avg. Non-Residential Density	0.54



SCENARIO D + LAND USE MAP



Legend

Rural Growth Boundary	SNL	INS	CC	NC	Protected Open Space
Urban Growth Boundary	SN	BP	MC	SMU	Unprotected Open Space
RN/ME	UN	IH	RC	UMU	

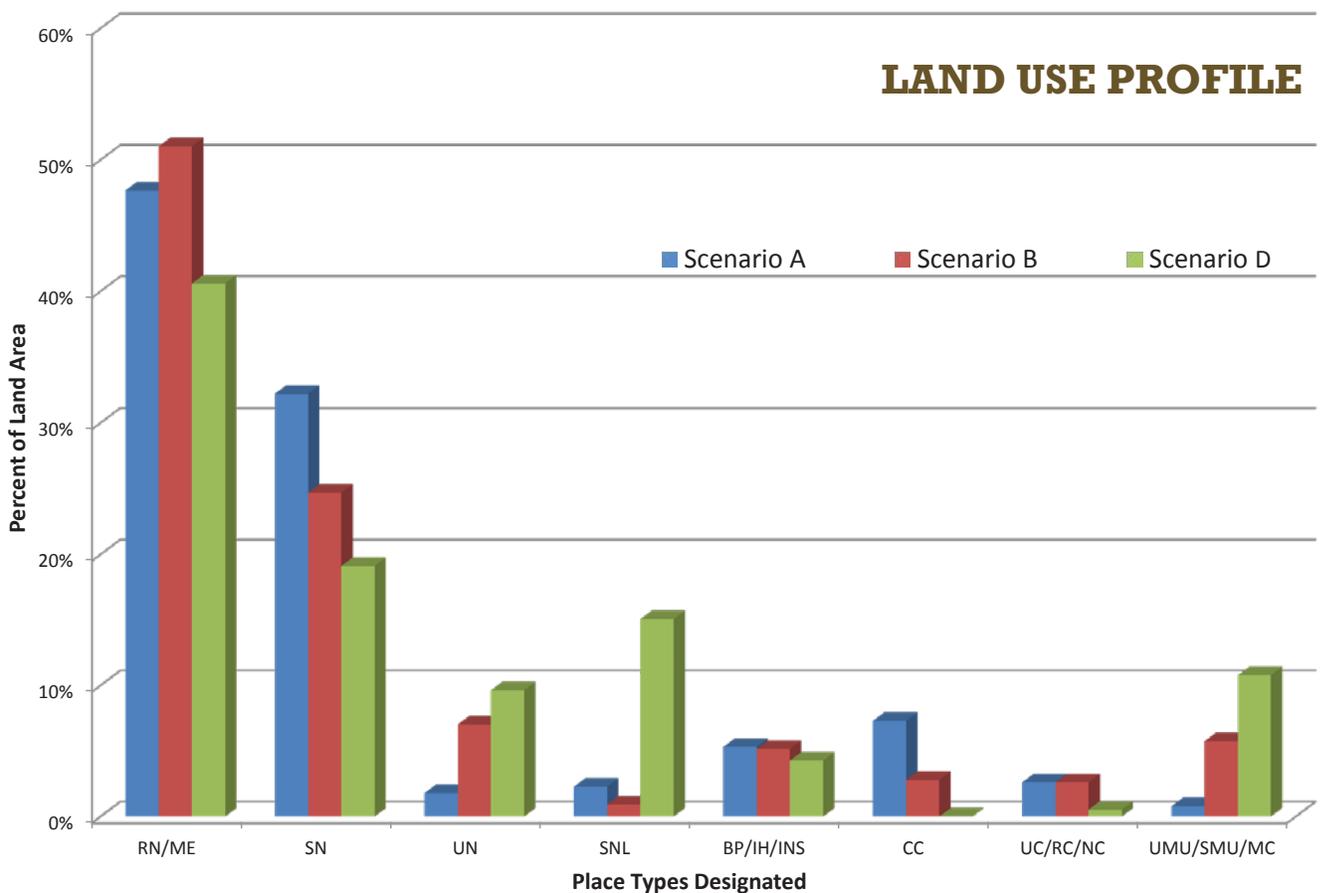
Scenario D is characterized by concentrating most of the growth in the center of the City. Due to the higher densities and concentration of growth, the scenario introduces the Metro Core, which has the highest development intensity of all of the place types. The resulting land use pattern under Scenario D will support the use of alternate modes of transportation.

SCENARIO INDICATOR SUMMARIES

The indicators for Phase 2 yielded similar results to those in Phase 1. The following charts, tables, and maps illustrate the output of performance measures for each indicator created using CommunityVIZ software.

Land Use

The land use profile in Phase 2 differs from Phase 1 mostly with regards to the rural and suburban neighborhood place types (RN/ME and SN). Compared to Phase 1, Phase 2 has a higher percentage of rural and suburban neighborhood place types in all three scenarios. However, similar to Phase 1, rural neighborhood and mountain estates, which are prevalent in Scenario A, are limited and are replaced by an increased number of urban and mixed-use development types in Scenarios B and D. It should also be noted that there is no Commercial Corridor (CC) place type in Scenario D, but rather Scenario D features the Metro Core (MC). The addition of these new place types into the land use toolbox allows Flagstaff to adapt to some of the changes in national patterns of land use and transportation planning.



Mobility

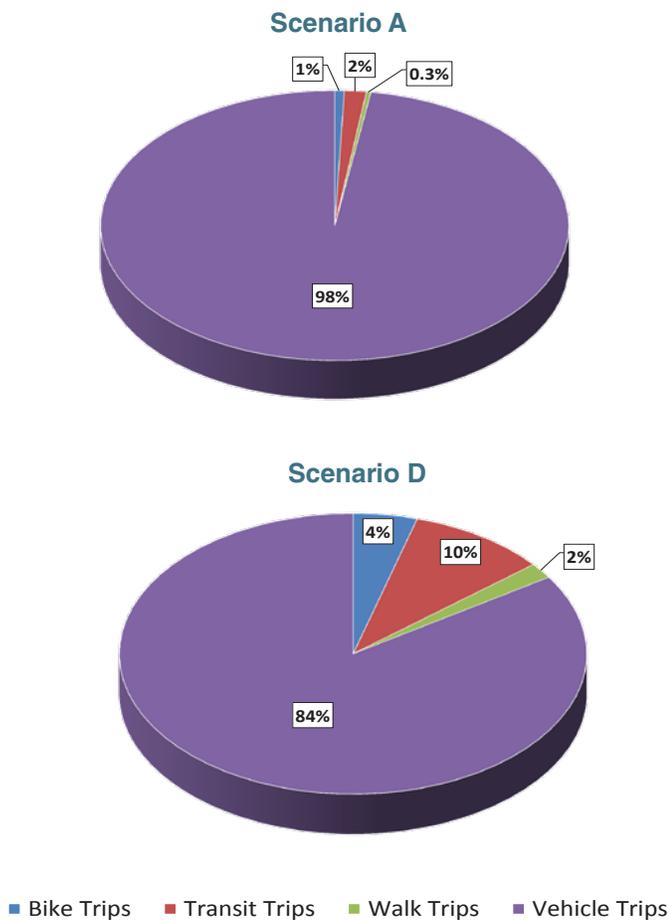
Similar to Phase 1, performance measures used to evaluate mobility included: daily trips by mode, vehicle miles traveled, annual fuel consumption, and trips generated in congested areas.

As shown in the tables, the Phase 2 shows a similar pattern as was shown in Phase 1, as density increases people are more likely to use alternate modes of transportation. As shown, more people are expected to use transit, bike, or walk to complete their trips in Scenarios B and D when compared to Scenario A.

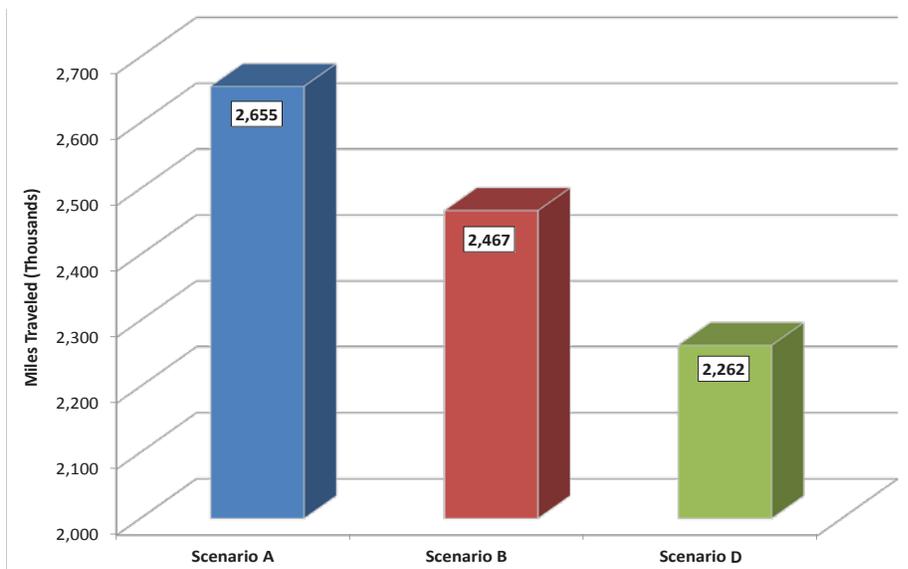
	SCENARIO A	SCENARIO B	SCENARIO D
Auto Trips (Daily)	272,064	252,754	231,813
Transit Trips (Daily)	4,201	14,860	26,460
Bike Trips (Daily)	1,834	6,686	12,171
Walk Trips (Daily)	876	3,216	4,932
Total Trips Generated (Daily)	278,974	277,516	275,376

The total number of trips decreases as density increases, which is expected. People living in higher densities tend to make fewer trips.

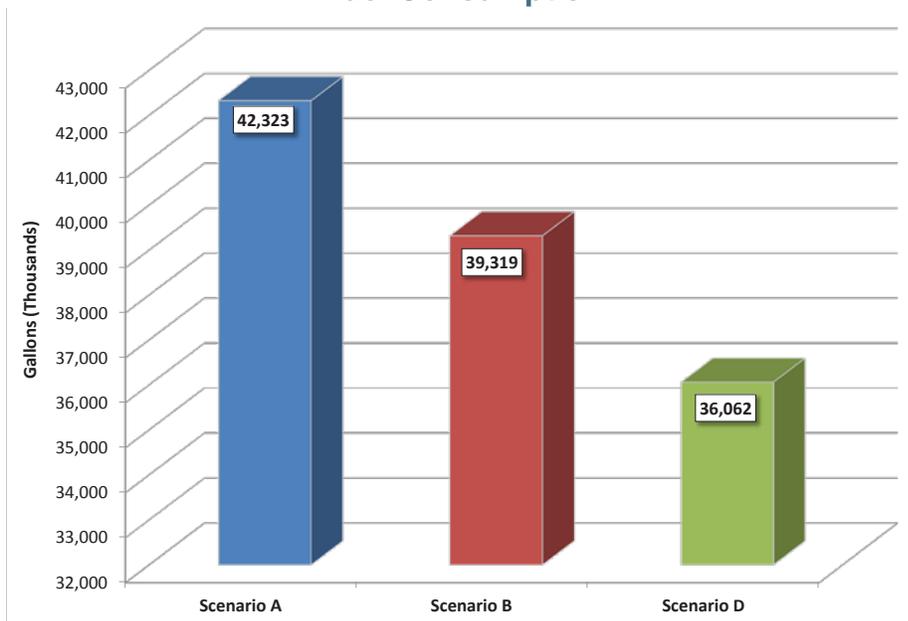
Daily Person Trips by Mode



Vehicle Miles Traveled



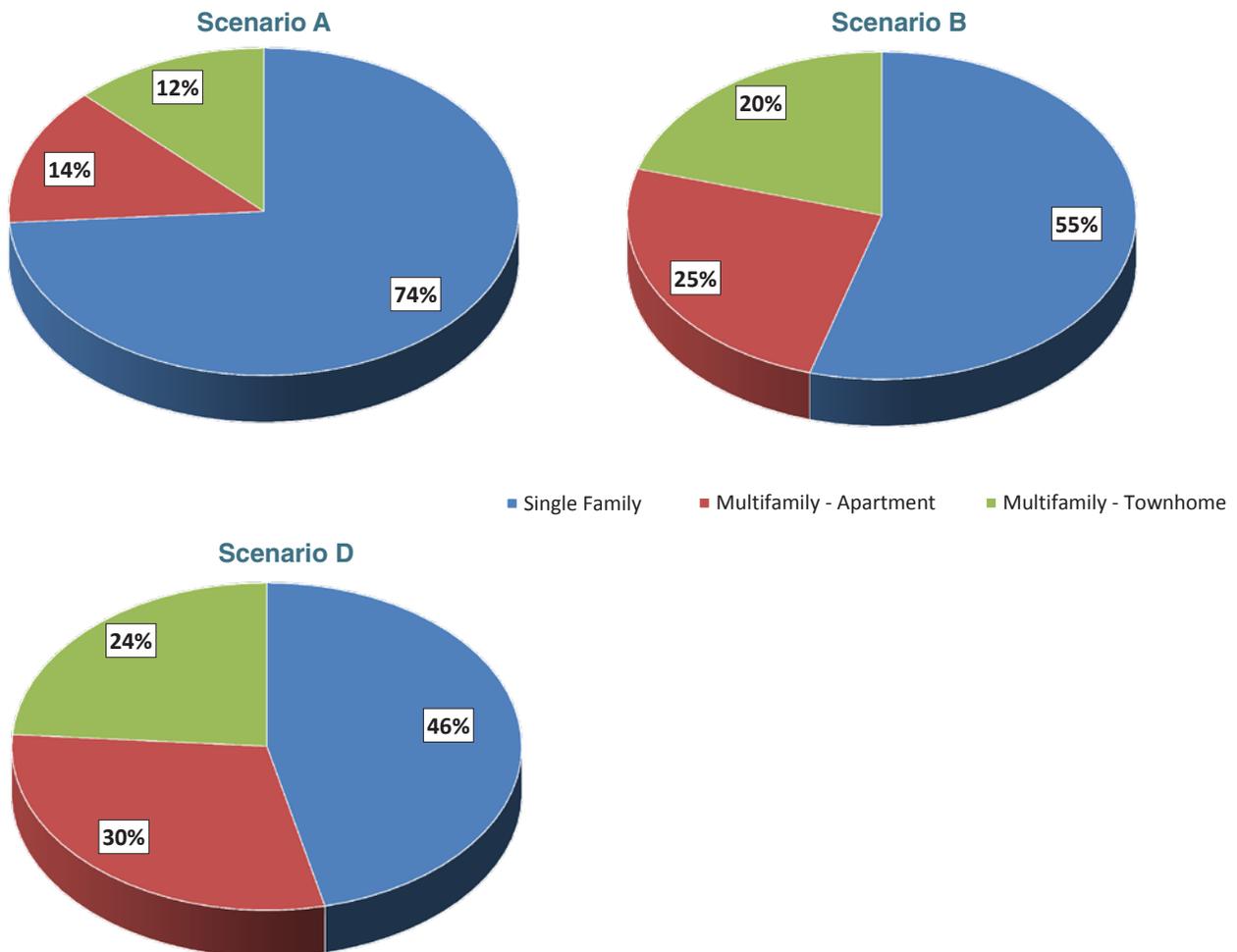
Fuel Consumption



Housing Mix

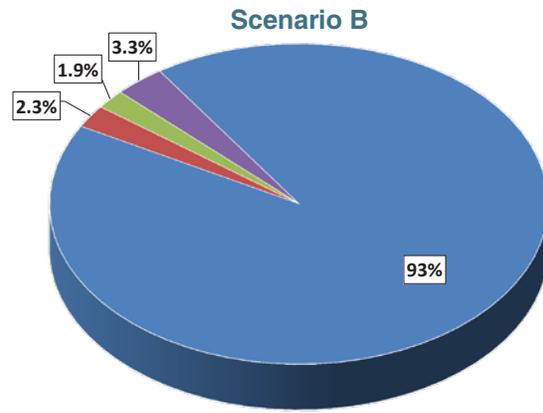
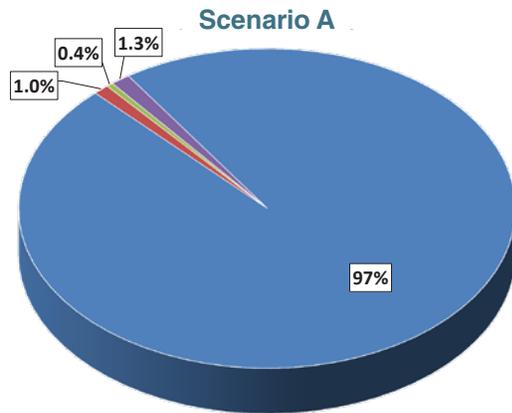
As stated previously, housing mix is an important indicator to illustrate the diversity of an area. It should also be stated that encouraging certain housing types, such as apartments or townhomes, can support the region's goals for transportation. People living in apartments are more likely to take advantage of transit, bike, and walk than those living in single family houses. The housing mix indicator for Phase 2 shows a similar pattern to that shown in Phase 1.

	SCENARIO A	SCENARIO B	SCENARIO D
Single Family Households	20,623	15,140	11,648
Multifamily - Apartment Units	3,813	6,949	7,488
Multifamily - Townhome Units	3,462	5,663	5,996
Total Households	27,897	27,752	25,131

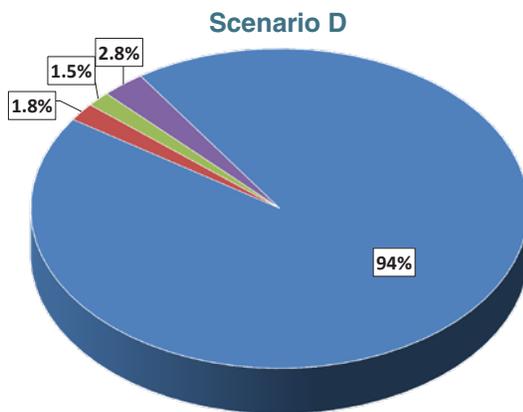


Water Demand

As with the daily trips, water demand tends to decrease as density increases. In general, single family detached homes use more water than apartments or townhomes. This is due to the fact that single family homes have lawns and gardens that need watering. Note that Scenario D has the least amount of single family homes and the least water demand.



■ Residential ■ Retail ■ Industrial ■ Service



	WATER USE RATES	GALLONS PER DAY
RESIDENTIAL HOUSEHOLDS	Rural Neighborhood/ Suburban Neighborhood	218/Household
	Urban Neighborhood/ Regional Center/ Neighborhood Center/ Suburban Mixed-Use	174/Household
	Urban Center/Urban Mixed-Use	161/Household
NON-RESIDENTIAL USES	Retail	874/Acre
	Industrial	5497/Acre
	Office	874/Acre

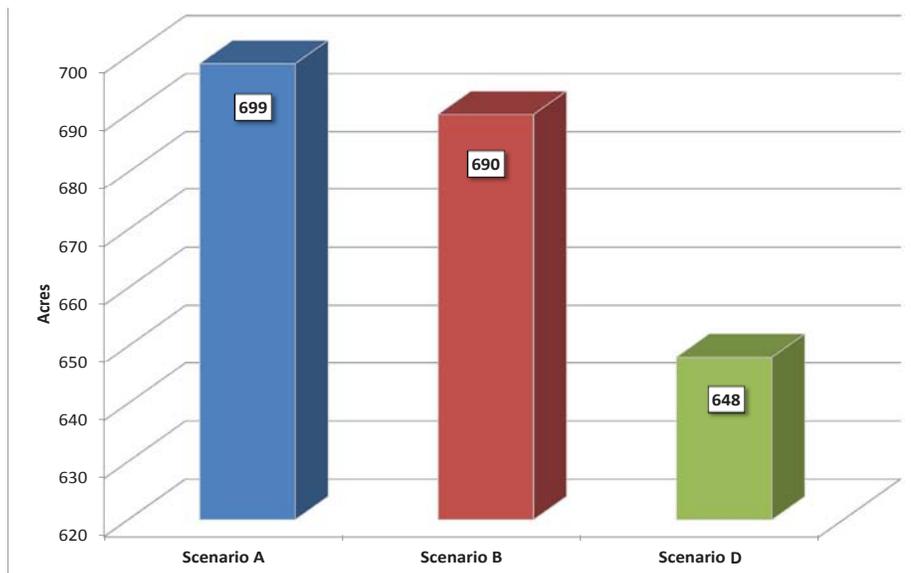
WATER USAGE	SCENARIO A	SCENARIO B	SCENARIO D
Daily Residential Water Demand (gallons)	5,946,143	5,566,229	5,300,706
Daily Retail Water Demand (gallons)	62,700	138,287	102,969
Daily Industrial Water Demand (gallons)	26,891	115,959	86,707
Daily Service Water Demand (gallons)	77,460	197,952	158,789
Daily Total Water Demand (gallons)	6,113,195	6,018,427	5,649,172



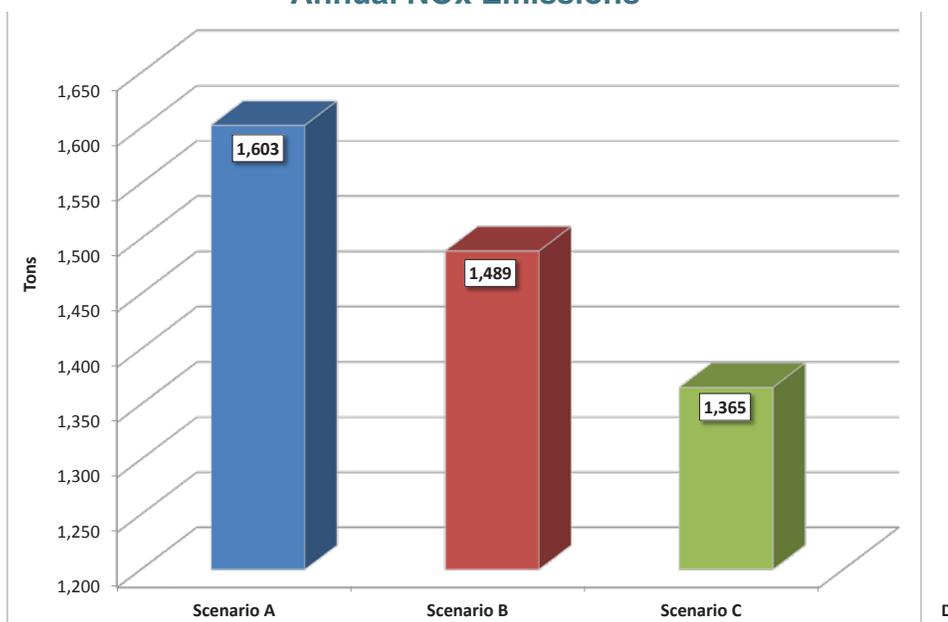
Environment

Environment is a broad category that includes the physical features of the region and the ability of policies and programs to protect certain environmentally-sensitive areas. New performance measures were added to this indicator in order to determine the impacts of development in each of the scenarios on the surrounding environment. As these performance measures were evaluated in Phase 2, Scenario C was not included in the analysis. The following performance measures used to evaluate the principle of environment include: building footprint, air quality emissions, proximity to passive and active parks, consumption of unprotected open space, and developed area within environmentally sensitive areas including Wildlife Corridors and Arizona Game and Fish Department (AZFGD) Conservation Priority Areas.

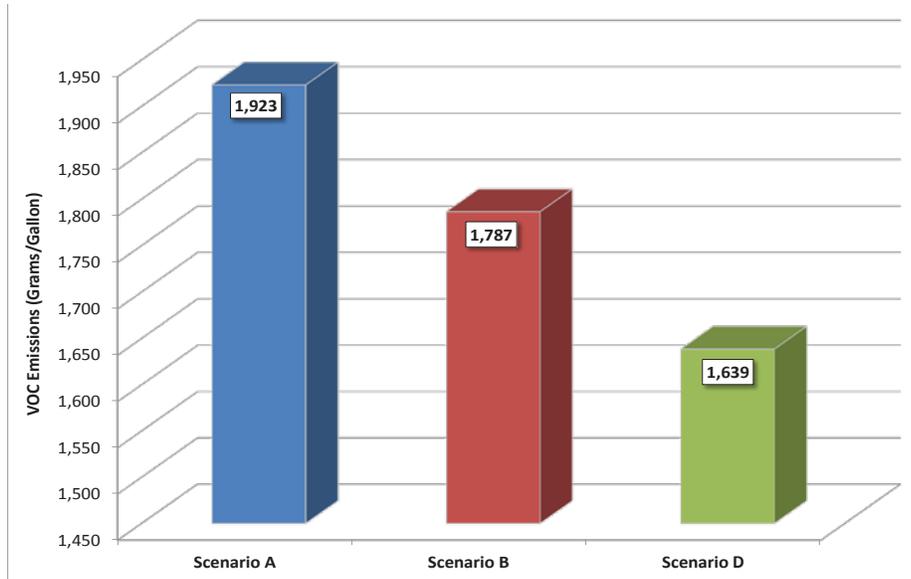
Building Footprint



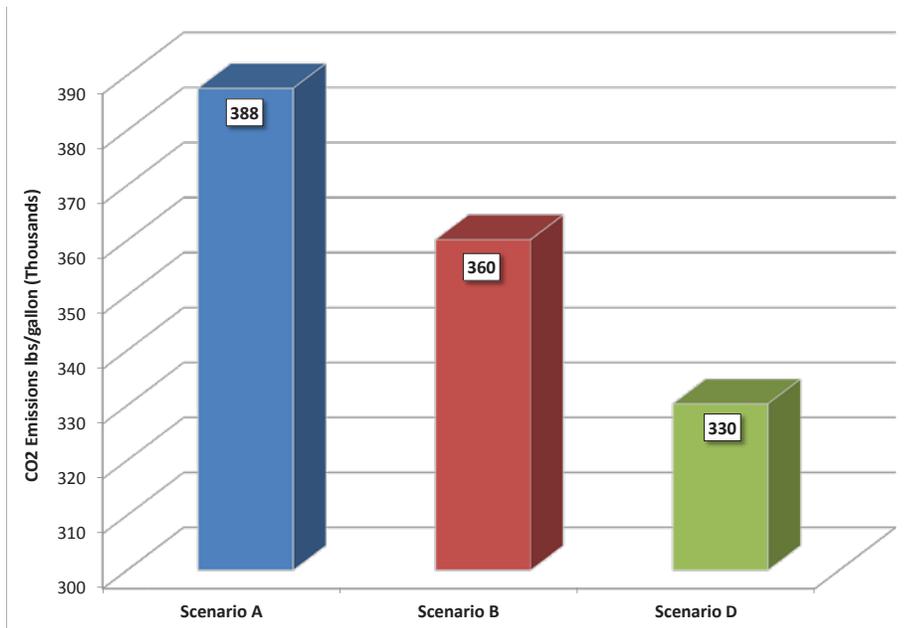
Annual NOx Emissions



Annual VOC Emissions



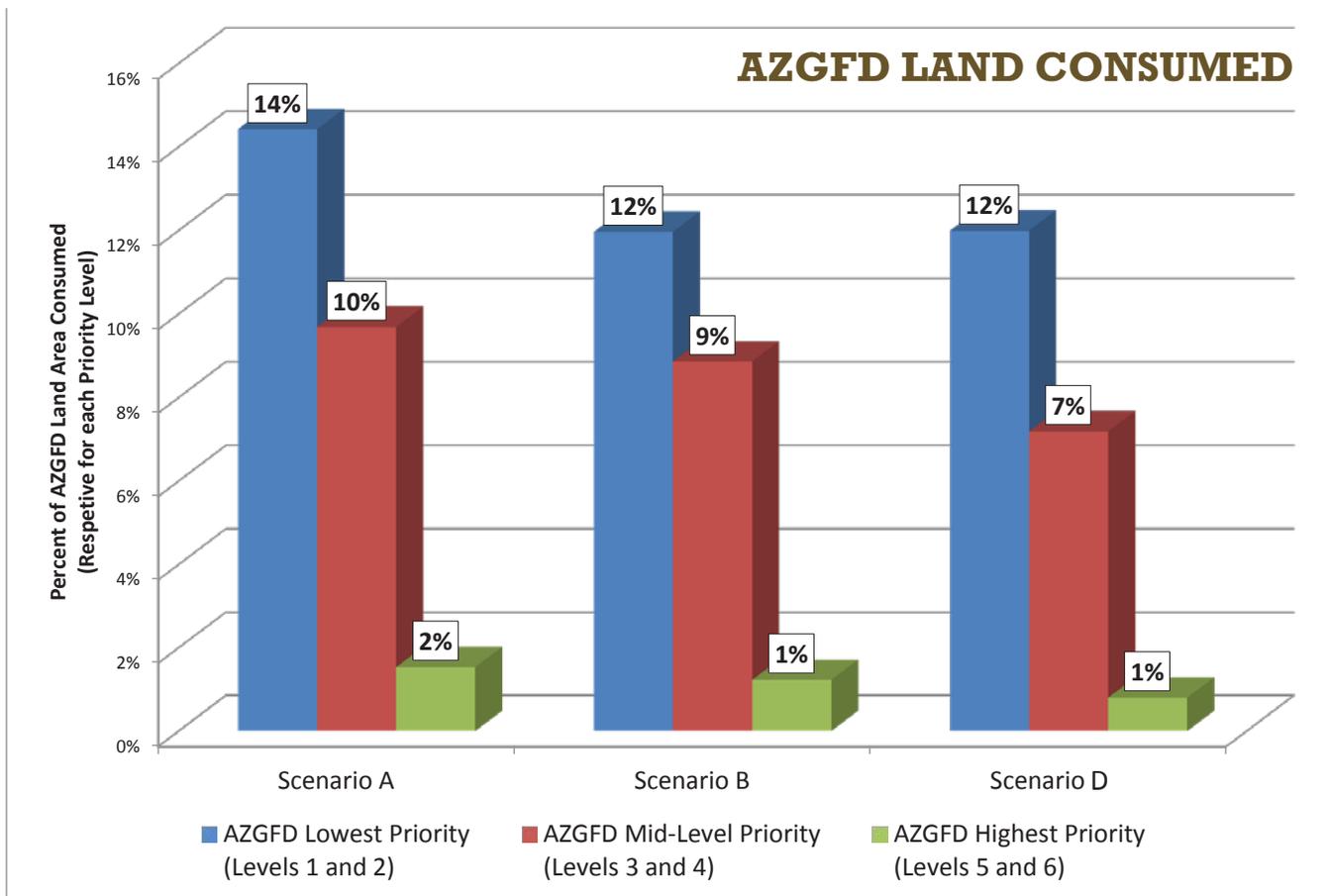
Annual CO2 Emissions



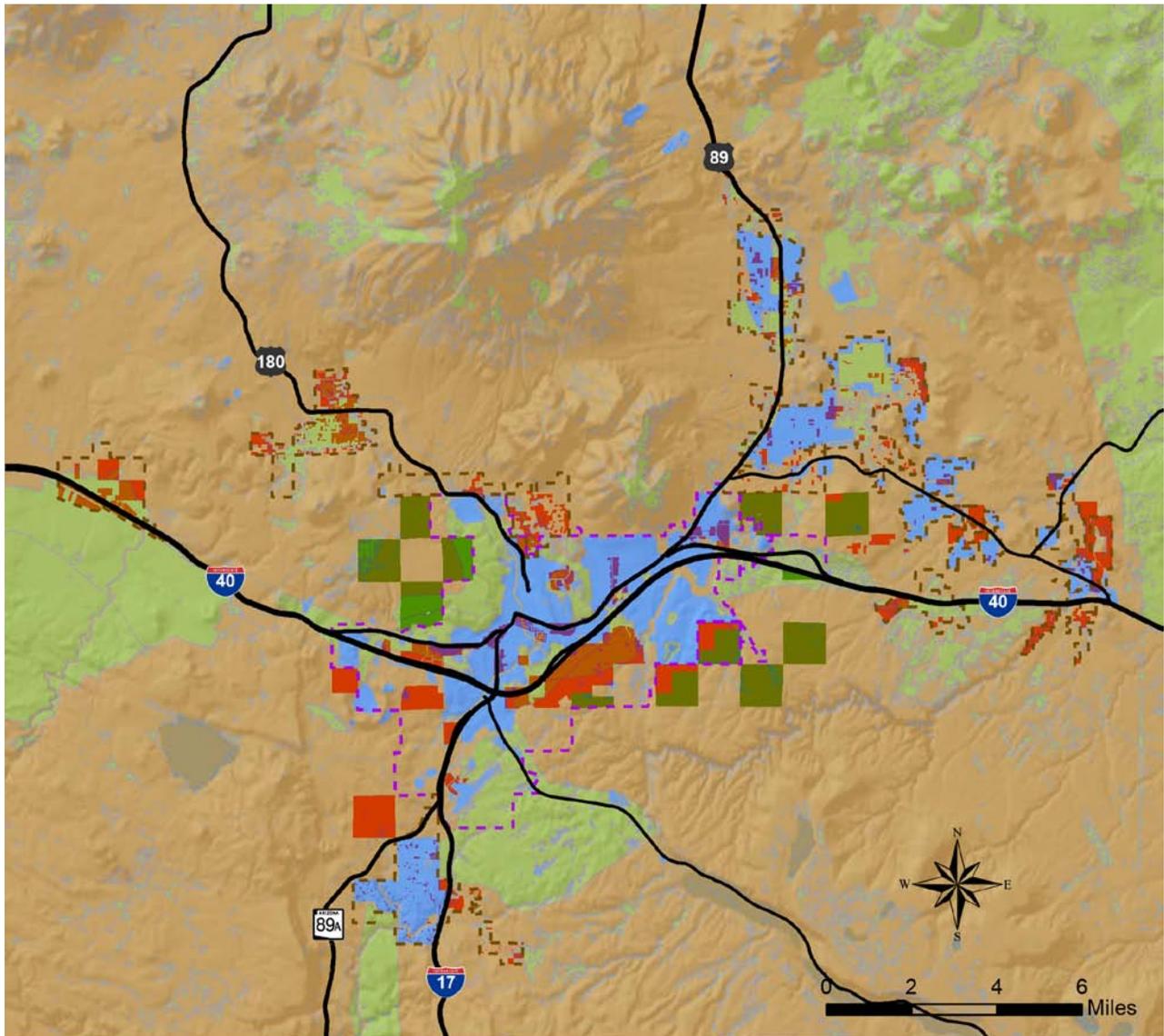
AZGFD CONSERVATION PRIORITY AREAS

AZGFD Conservation Priority Areas were categorized into three types, Lowest Priority, Mid-Level, and Highest Priority. The Highest Priority areas are those that have the highest conservation needs. The map and chart indicate the amount of land consumed by development in each of the three categories.

AZGFD CONSERVATION PRIORITY AREAS (ACRES)	TOTAL ACRES	SCENARIO A	SCENARIO B	SCENARIO D
AZGFD Lowest Priority (Levels 1 and 2)	10,308	1,487	1,234	1,237
AZGFD Lowest Priority (Levels 3 and 4)	46,385	4,495	4,112	3,335
AZGFD Lowest Priority (Levels 5 and 6)	275,245	4,226	3,381	2,207
Total Land Consumed (acres)	331,938	10,208	8,727	6,779



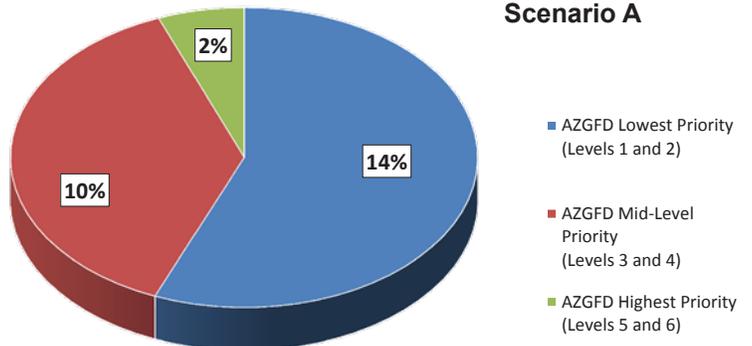
SCENARIO A + PRIORITY LEVELS MAP



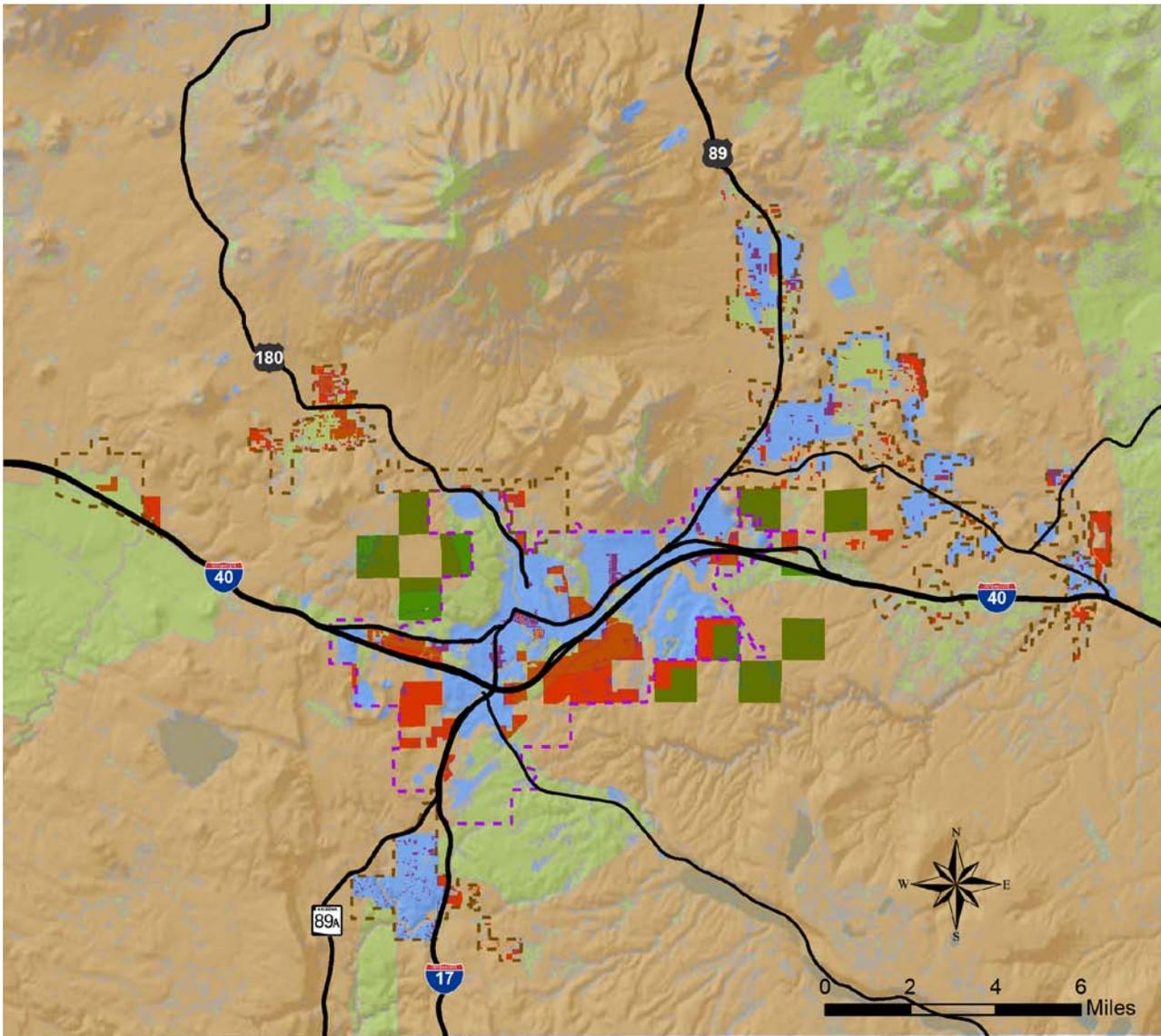
Legend

- Rural Growth Boundary
- Urban Growth Boundary
- Parcels Where Chip Was Played**
- Changed to Protected Open Space
- All Other Parcels
- AZGFD Conservation Priority Areas**
- Lowest Priority (Levels 1 and 2)
- Mid-Level Priority (Levels 3 and 4)
- Highest Priority (Levels 5 and 6)

AZGFD Land Consumed Scenario A



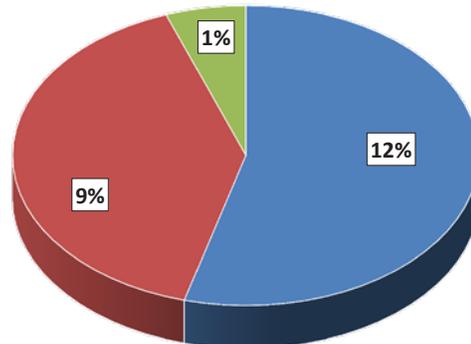
SCENARIO B + PRIORITY LEVELS MAP



Legend

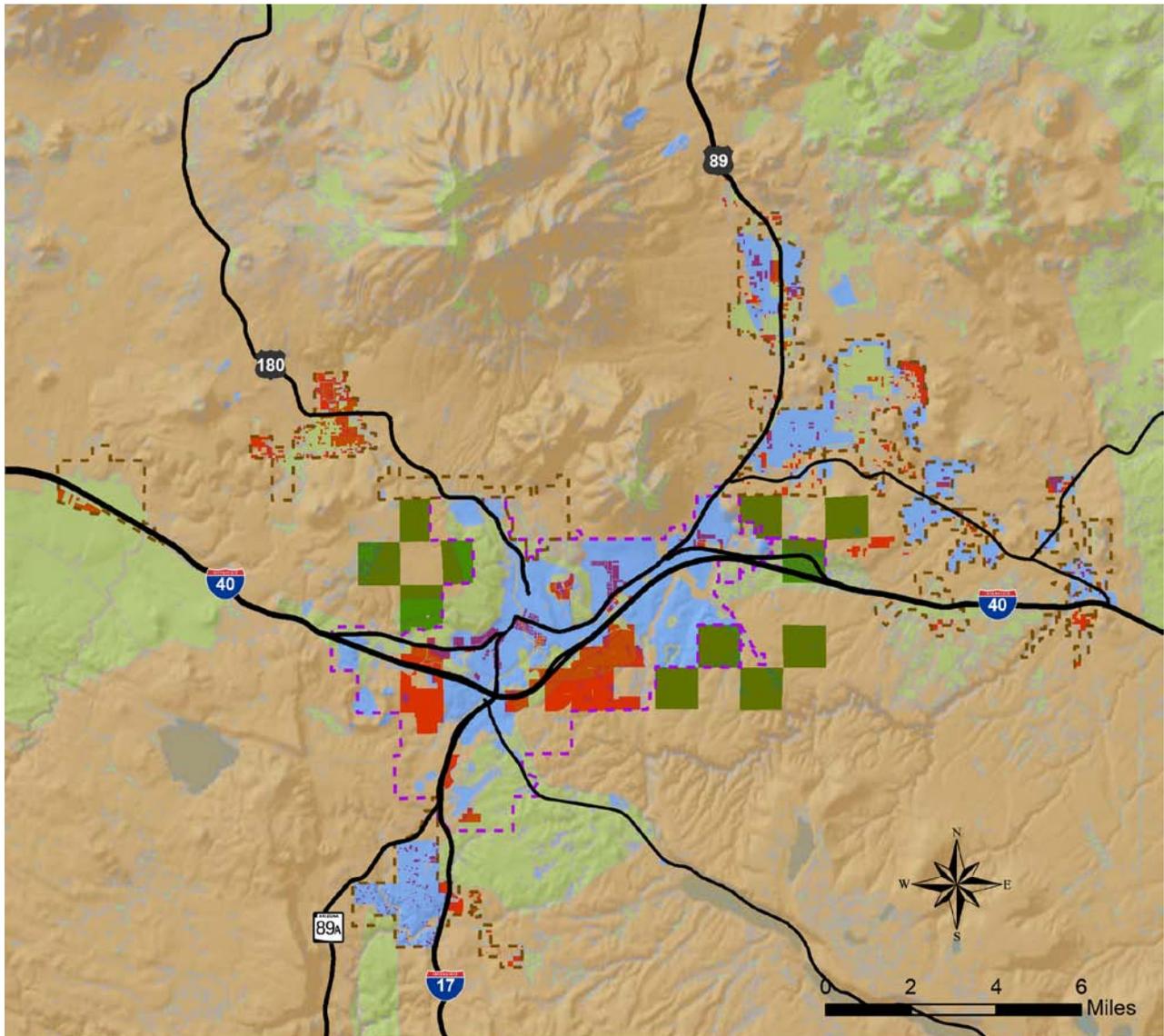
- Rural Growth Boundary
- Urban Growth Boundary
- Parcels Where Chip Was Played**
- Changed to Protected Open Space
- All Other Parcels
- AZGFD Conservation Priority Areas**
- Lowest Priority (Levels 1 and 2)
- Mid-Level Priority (Levels 3 and 4)
- Highest Priority (Levels 5 and 6)

AZGFD Land Consumed Scenario B



- AZGFD Lowest Priority (Levels 1 and 2)
- AZGFD Mid-Level Priority (Levels 3 and 4)
- AZGFD Highest Priority (Levels 5 and 6)

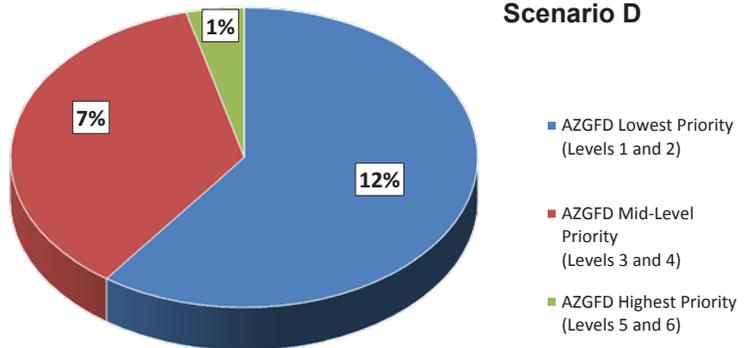
SCENARIO D + PRIORITY LEVELS MAP



Legend

- Rural Growth Boundary
- Urban Growth Boundary
- Parcels Where Chip Was Played**
 - Changed to Protected Open Space
 - All Other Parcels
- AZGFD Conservation Priority Areas**
 - Lowest Priority (Levels 1 and 2)
 - Mid-Level Priority (Levels 3 and 4)
 - Highest Priority (Levels 5 and 6)

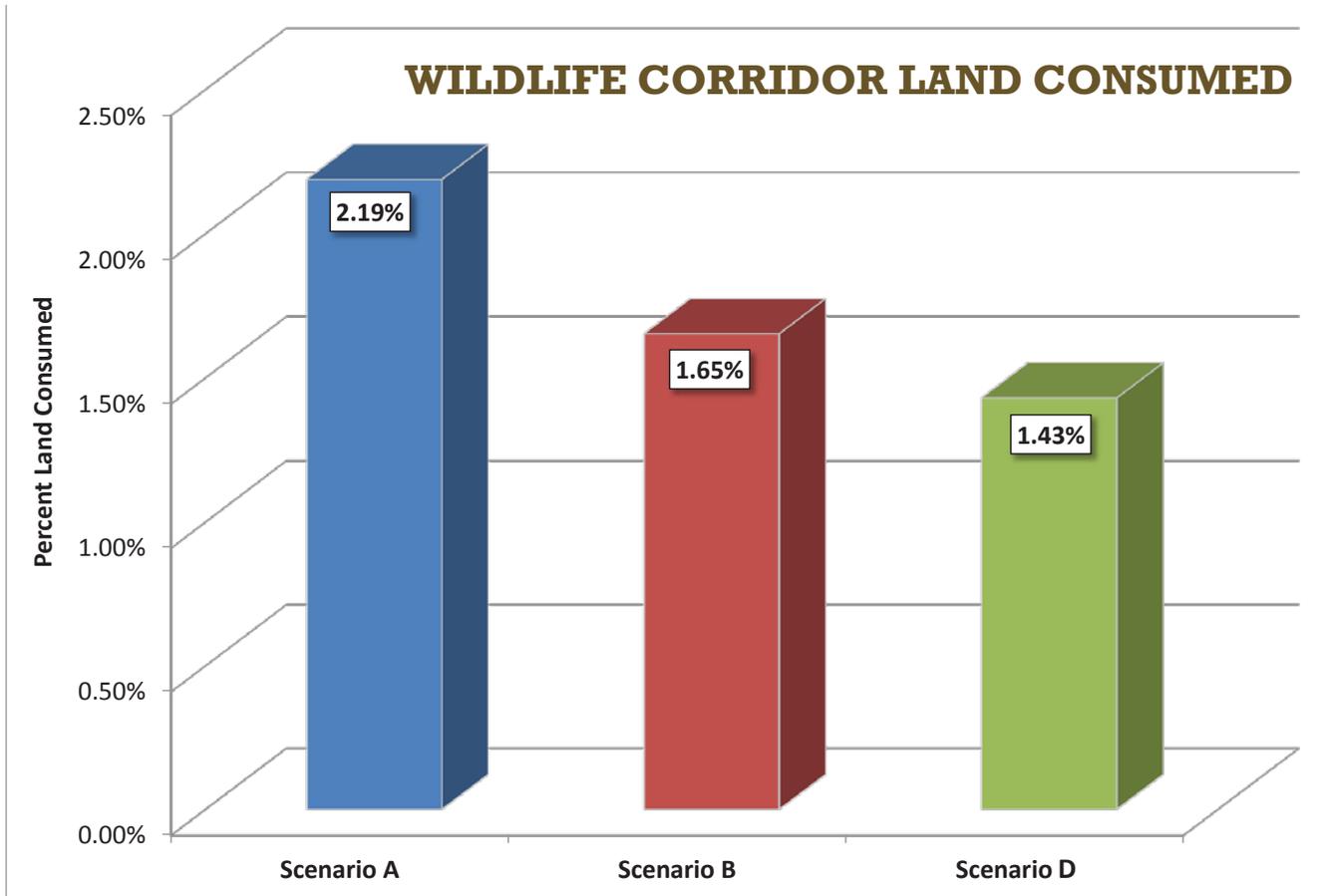
AZGFD Land Consumed Scenario D



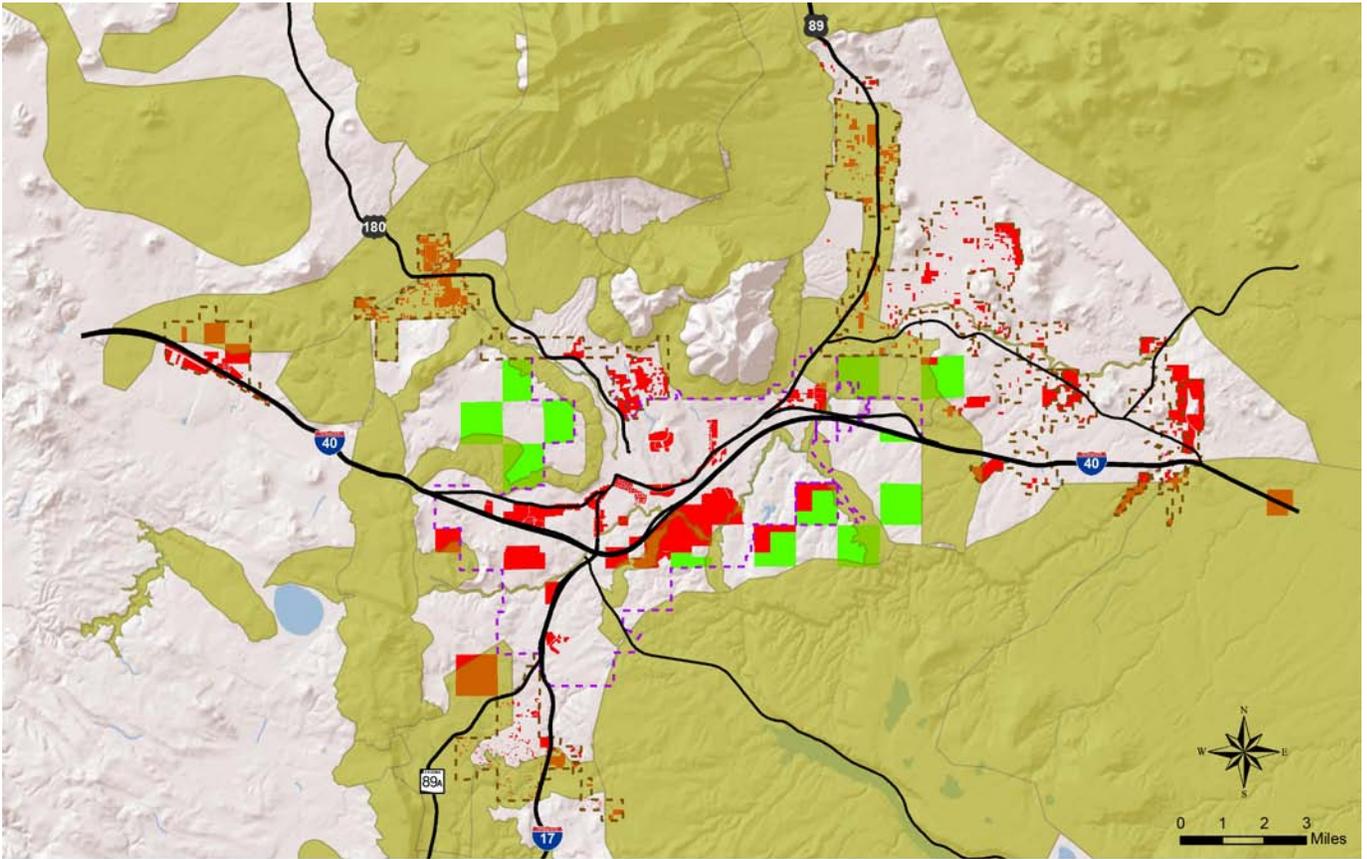
WILDLIFE CORRIDORS

Wildlife corridors are areas enable species to migrate between larger habitat areas, preventing species isolation and fragmentation. The map and chart indicate the amount of land consumed by development in wildlife corridors.

WILDLIFE CORRIDORS (ACRES)	TOTAL ACRES	TOTAL ACRES CONSUMED		
		SCENARIO A	SCENARIO B	SCENARIO D
Wildlife Corridors	219,271	4,797	3,623	3,135



SCENARIO A + WILDLIFE CORRIDOR MAP

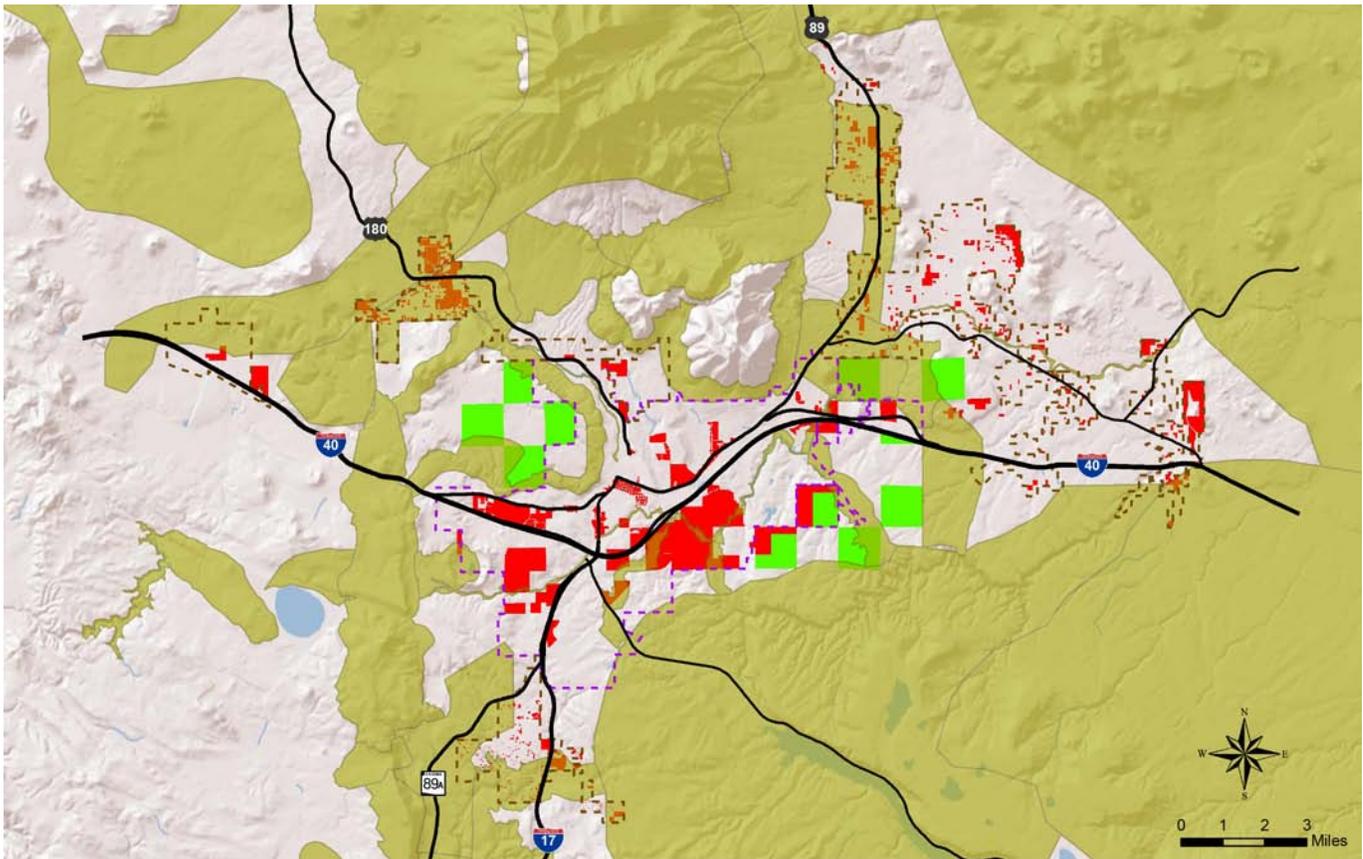


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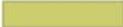
- | | |
|---|---|
|  Rural Growth Boundary | Parcels Where Chip Was Played |
|  Urban Growth Boundary |  Changed to Protected Open Space |
|  Wildlife Corridors |  All Other Parcels |



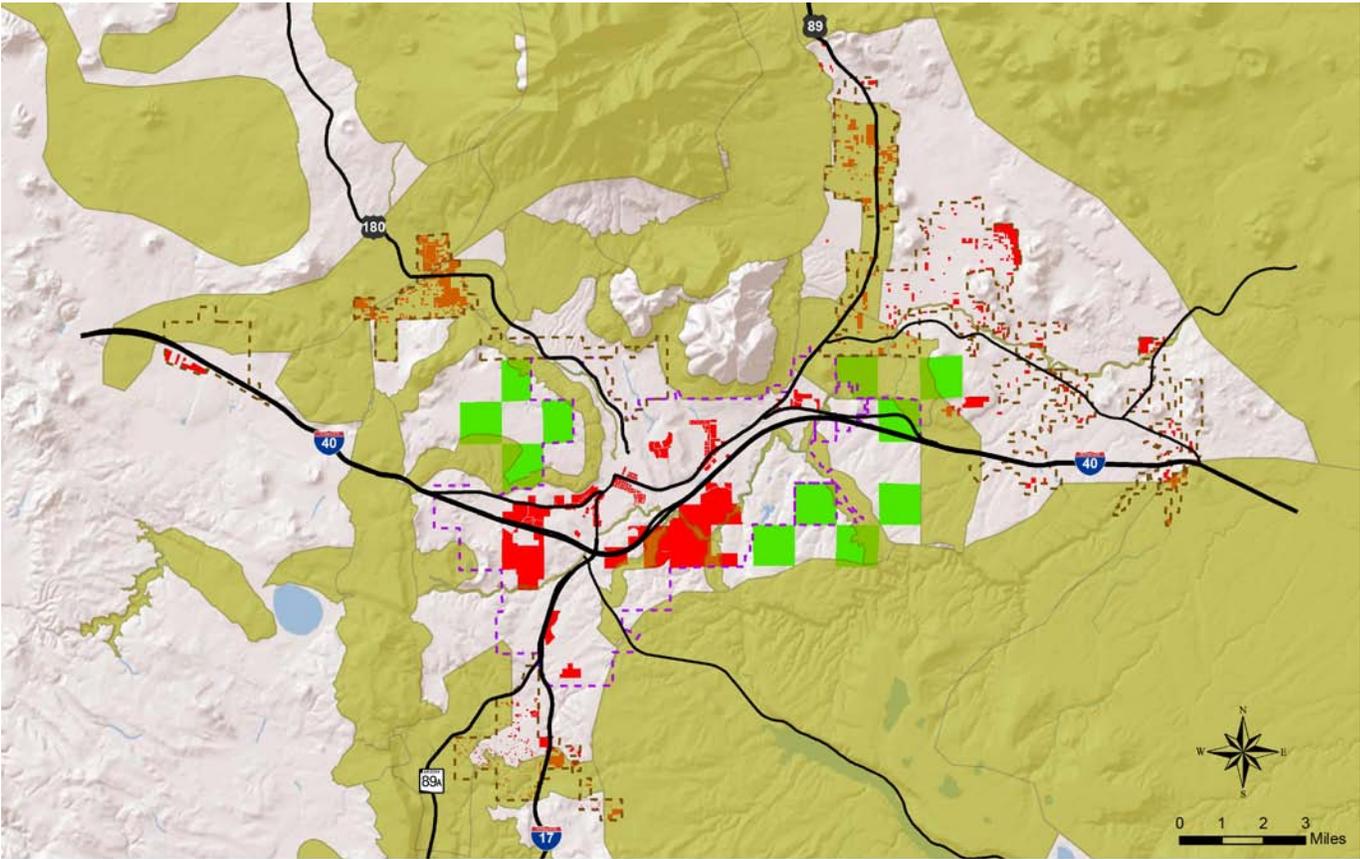
SCENARIO B + WILDLIFE CORRIDOR MAP



Legend

- | | | | |
|--|-----------------------|---|---------------------------------|
|  | Rural Growth Boundary | Parcels Where Chip Was Played | |
|  | Urban Growth Boundary |  | Changed to Protected Open Space |
|  | Wildlife Corridors |  | All Other Parcels |

SCENARIO D + WILDLIFE CORRIDOR MAP



- Legend**
- Rural Growth Boundary
 - Urban Growth Boundary
 - Wildlife Corridors
- Parcels Where Chip Was Played**
- Changed to Protected Open Space
 - All Other Parcels

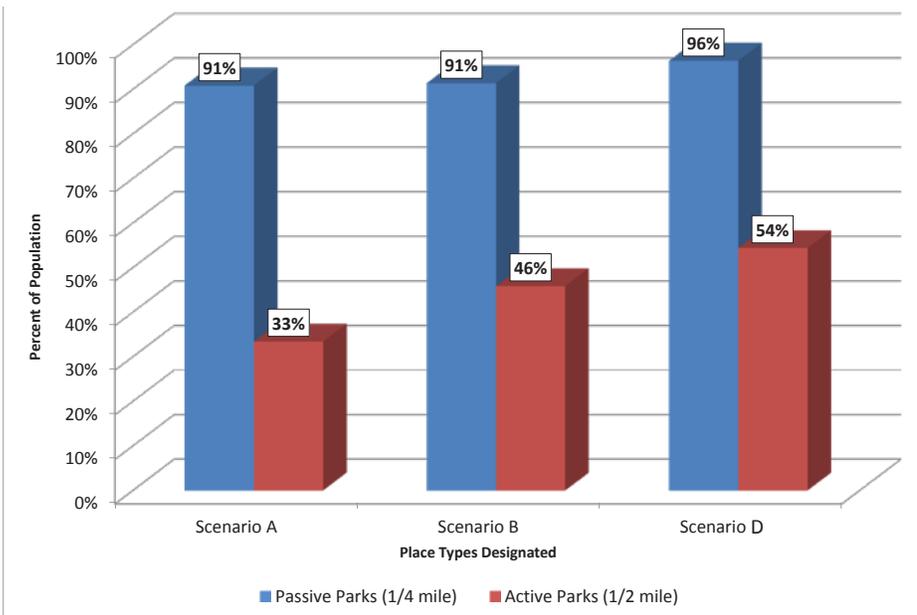


PROXIMITY TO PASSIVE AND ACTIVE PARKS

This indicator calculates the number of people within a specified distance to either passive or active parks. Passive parks are areas of protected open space, such as national forest lands, and the FUTS trail. The specified distance for passive parks was a quarter mile. Active parks are areas where a higher intensity of recreational activity takes place and includes playgrounds, sports fields and courts, swimming pools, skating rinks, tennis facilities, and other support facilities. Providing increased access to these areas encourages healthy lifestyles and promotes a sense of community. In areas with higher densities, as in Scenarios B and C, smaller parks tend to be more frequent to compensate for the reduction in yards associated with single-family style development.

PROXIMITY TO PARKS (POPULATION)	SCENARIO A	SCENARIO B	SCENARIO D
Population within ¼ mile to Passive Parks	65,897	65,951	69,020
Population within ½ mile to Active Parks	24,228	33,080	38,953

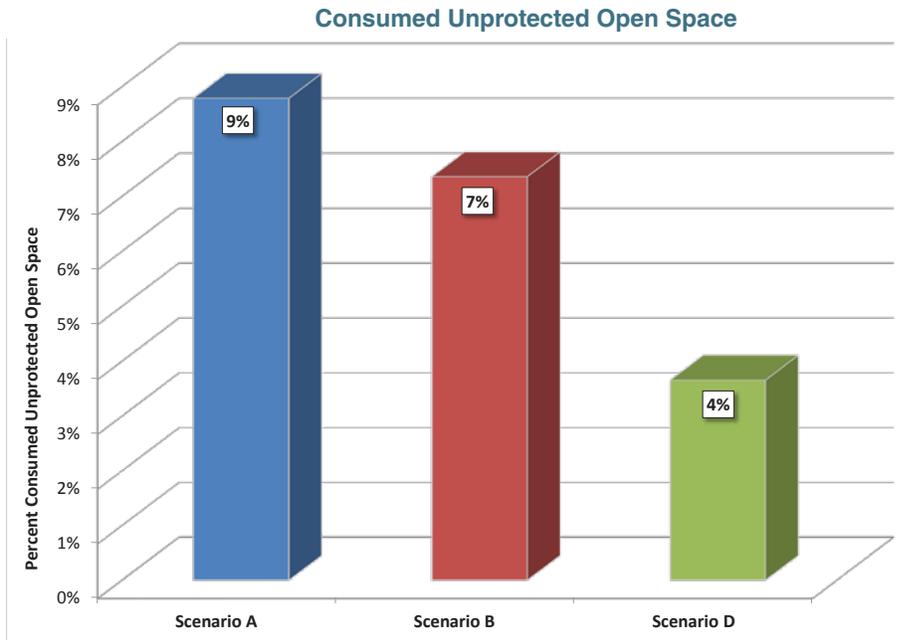
Percent of Population in Proximity to Parks



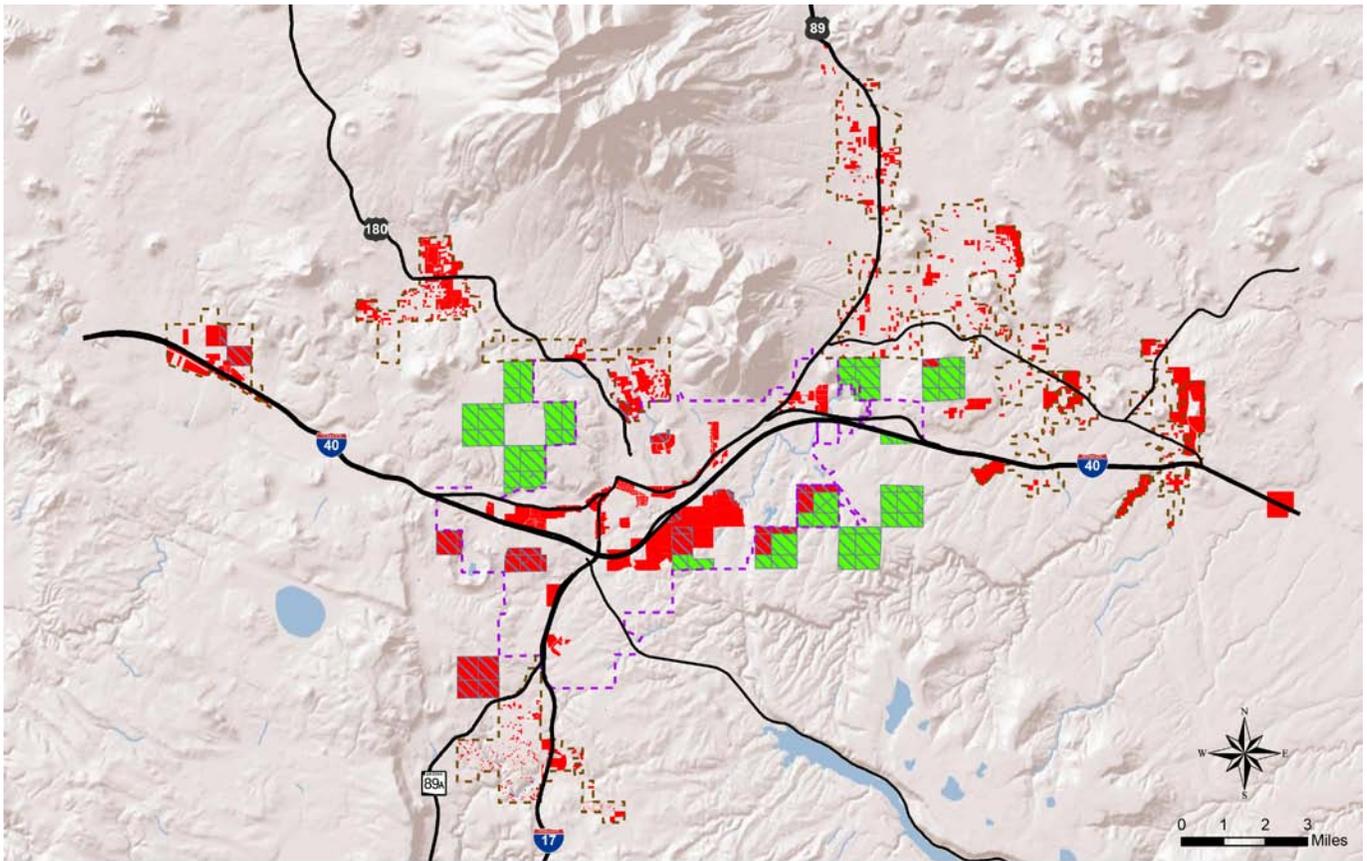
CONSUMED UNPROTECTED OPEN SPACE

There are two types of open spaces used in this analysis, protected and unprotected. Protected open space is land that is protected as a national or state forest, BLM land, etc. Unprotected open space is land that is currently undeveloped that does not have regulations or restrictions inhibiting development. The amount of unprotected open space that was consumed by development was identified for each scenario.

CONSUMED UNPROTECTED OPEN SPACE (ACRES)	TOTAL EXISTING UNPROTECTED OPEN SPACE	TOTAL ACRES CONSUMED		
		SCENARIO A	SCENARIO B	SCENARIO D
Consumed Unprotected Open Space (acres)	26,631	2,340	1,959	973



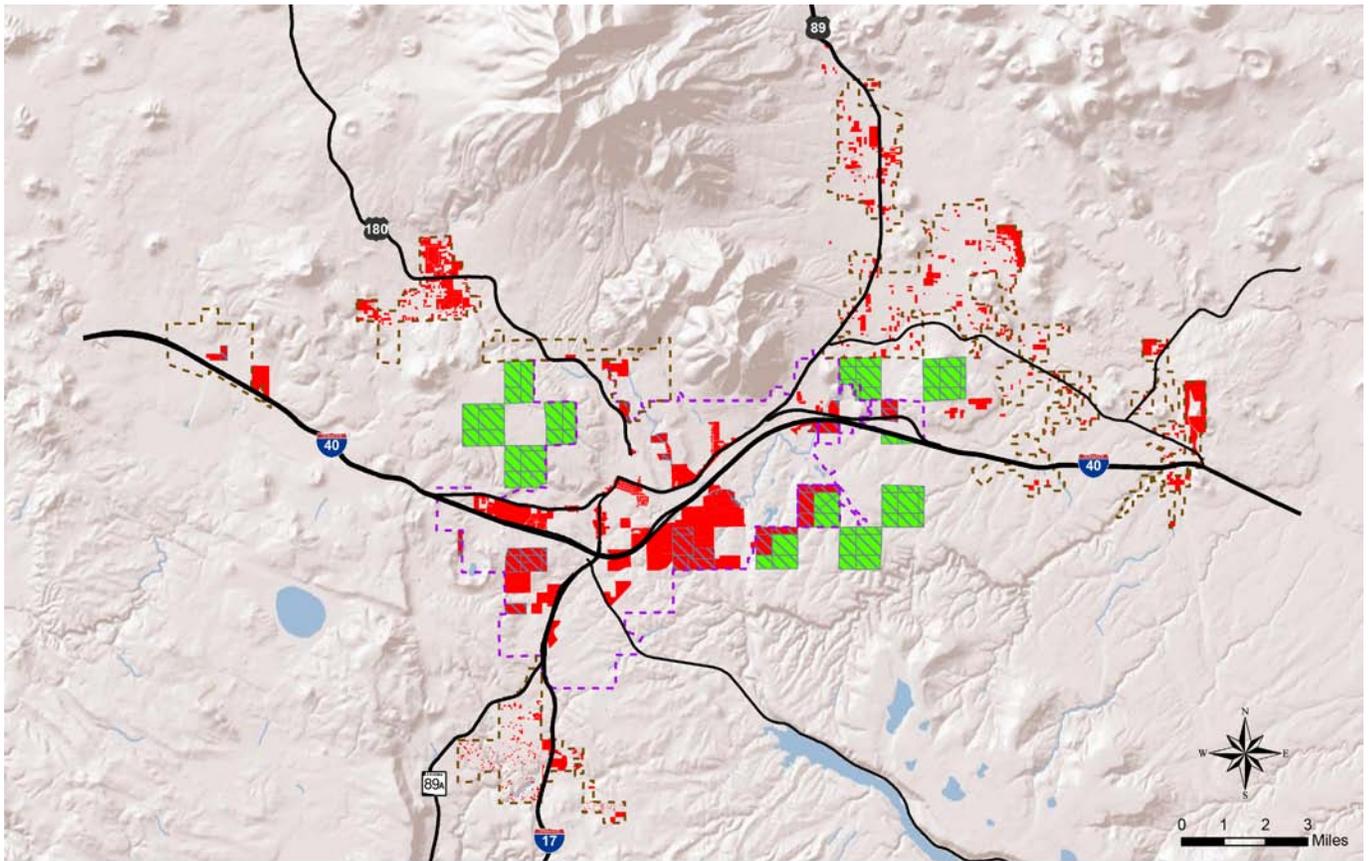
SCENARIO A + CONSUMED OPEN SPACE MAP



Legend

- | | |
|---|---|
|  Rural Growth Boundary | Parcels Where Chip Was Played |
|  Urban Growth Boundary |  Changed to Protected Open Space |
|  Previously Unprotected Open Space |  All Other Parcels |

SCENARIO B + CONSUMED OPEN SPACE MAP

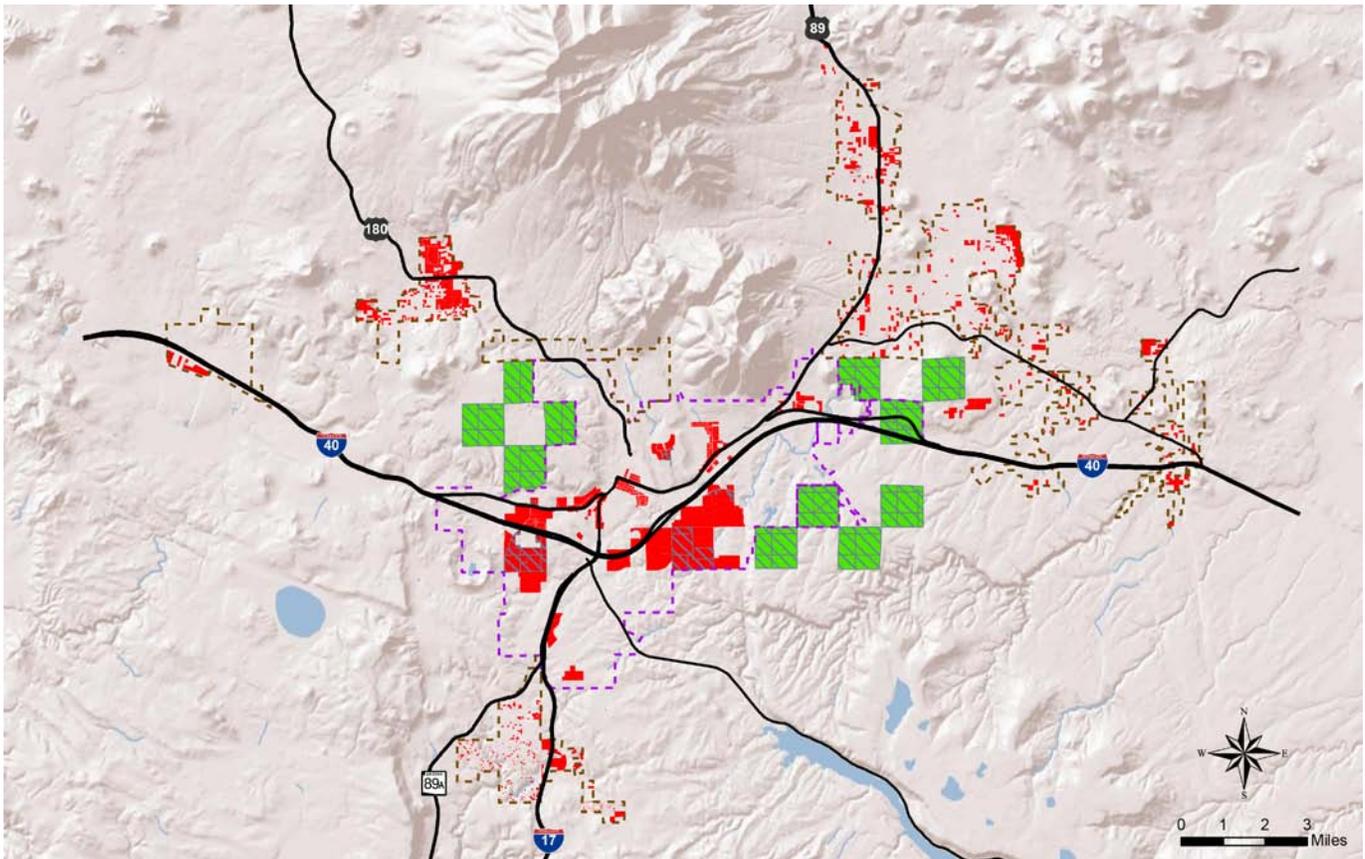


Legend

- | | |
|---|---|
|  Rural Growth Boundary | Parcels Where Chip Was Played |
|  Urban Growth Boundary |  Changed to Protected Open Space |
|  Previously Unprotected Open Space |  All Other Parcels |



SCENARIO D + CONSUMED OPEN SPACE MAP



Legend

- | | |
|---|---|
|  Rural Growth Boundary | Parcels Where Chip Was Played |
|  Urban Growth Boundary |  Changed to Protected Open Space |
|  Previously Unprotected Open Space |  All Other Parcels |



► Conclusions & Recommendations

Growth is inevitable in the City and the County. The purpose of this study is to evaluate different ways growth can occur in order to make sound policy and planning decisions that will manage the future growth. As shown in both the Phase 1 and Phase 2 analysis, as growth develops at a higher-density the use of alternate modes of transportation becomes more prevalent, water demand, fuel consumption, and vehicle miles traveled all decrease, and the impact to the surrounding environment also decreases. It should be noted, however, that high density development is not always a plausible solution. There are some benefits, but it has to make sense for the community in terms of development goals and the character of the region.

The goal of this document is to serve as a resource for decision-makers including citizens to move toward establishing a future vision for growth in the Flagstaff Region. This study is just one of several analyses that are being used as qualitative assessments against the guiding principles and assumptions developed through the Flagstaff Regional Plan 2012. The next steps in the scenario planning process is take the information in this report and begin developing the preferred scenario, one that fits within the guiding principles of the Flagstaff Regional Plan.

It is anticipated that a preferred scenario will be identified from the three scenarios analyzed in Phase 2. The CAC will discuss each scenario and each of the indicators to determine the preferred scenario. It may be the case that optimal characteristics from certain scenarios will be combined to create a new, preferred scenario. Much work will need to be done at the local level to evaluate the preferred development scenario and support recommendations before they might become reality. Additional sub-area scenario analyses, based on the preferred scenario, will be completed at a later time, as part of a separate study, to more fully understand different growth and transportation alternatives in key focus areas around the city and region.



APPENDIX - ASSUMPTION TABLES

PLACE TYPES																
	RN	ME	SN	SNL	UN	BP	IH	INS	CC	UC	RC	NC	MC	SMU	UMU	
	RURAL NEIGHBORHOOD	MOUNTAIN ESTATES	SUBURBAN NEIGHBORHOOD	SUBURBAN NEIGHBORHOOD LIGHT	URBAN NEIGHBORHOOD	BUSINESS PARK	HEAVY INDUSTRIAL	INSTITUTIONAL	COMMERCIAL CORRIDOR	URBAN CENTER	REGIONAL CENTER	NEIGHBORHOOD CENTER	METRO CORE	SUBURBAN MIXED-USE	URBAN MIXED-USE	
Site Efficiency	0.99	0.99	0.95	0.85	0.95	0.80	0.90	0.80	0.80	0.80	0.80	0.80	0.90	0.90	0.90	
FAR	0.10	0.10	0.15	--	0.30	0.40	0.25	0.40	0.23	0.45	0.30	0.30	1.20	0.50	0.70	
DENSITY	0.25	1	7	3.50	18	--	--	--	--	13	10	10	15	12	22	
% Residential	1	1	1	1	0.85	--	--	--	--	--	--	0.25	0.60	0.30	0.40	
% Non Residential	--	--	--	--	0.15	1	1	1	1	1	1	0.75	0.40	0.70	0.60	
Building Height	2	1	2	1	3	4	3	3	3	5	4	3	5	2	5	
Single Family Ratio	1	1	0.80	1	0.10	--	--	--	--	--	--	--	--	0.20	--	
Townhouse Ratio	--	--	0.10	--	0.50	--	--	--	--	--	--	0.40	--	0.30	0.40	
Apartment Ratio	--	--	0.10	--	0.40	--	--	--	--	--	--	0.60	--	0.50	0.60	
Household Size	2.60															
% Office	--	--	--	--	0.25	0.15	0.10	0.10	0.30	0.25	0.00	0.00	0.30	0.25	0.25	
% Retail	--	--	--	--	0.25	0.00	--	0.10	0.50	0.30	0.75	0.75	0.45	0.40	0.40	
% Industrial	--	--	--	--	0.10	0.70	0.90	--	--	0.05	--	--	--	0.05	--	
% Service	--	--	--	--	0.30	0.15	--	0.10	0.20	0.20	0.25	0.25	0.10	0.15	0.10	
% Institutional	--	--	--	--	0.10	--	--	0.70	--	0.20	--	--	0.15	0.15	0.25	
Retail Employment Rate	1 Employee for Every 900 square feet of floor space															
Industrial Employment Rate	1 Employee for Every 370 square feet of floor space															
Service Employment Rate	1 Employee for Every 320 square feet of floor space															
Office Employment Rate	1 Employee for Every 320 square feet of floor space															
Institutional Employment Rate	1 Employee for Every 400 square feet of floor space															
Trip Generation	10	10	10	10	7	--	--	--	7	6	6	6	7	8	6	
Average Trip Length (mile)*	9.76															
Average Passenger Car Fuel Efficiency (miles/gallon)**	22.90															
* Average length of trip for vehicles associated with the dwelling units. Default value is from the US Bureau of Transportation Statistics (2006).																
** Average fuel efficiency of cars used by residents. Default value is from the US Bureau of Transportation Statistics																

APPENDIX - ASSUMPTION TABLES

PLACE TYPES	
New Households	Parcel Area * Site Efficiency by Place Type * % Residential by Place Type / 43,560 * Density by Place Type
Population	New Households * Average Household Size
Average Residential Density	(Sum (Total Residential Area by Place Type * Density by Place Type) / (Sum (Total Residential Area by Place Type))
Non-Residential Square Feet	Parcel Area * Site Efficiency by Place Type * FAR by Place Type * % Non-Residential
Employment	Sum ((Non-Residential Square Feet * Percent Institutional) + (Non-Residential Square Feet * Percent Industrial) + (Non-Residential Square Feet * Percent Office) + (Non-Residential Square Feet * Percent Retail) + (Non-Residential Square Feet * Percent Service))
Average Non-Residential Density	(Sum (Total Non-Residential Area by Place Type * FAR by Place Type) / (Sum (Total Non-Residential Area by Place Type))
Person Trips	New Households * Person Trip Generation
Transit Trips	New Households * Person Trip Generation * % Transit Mode Share by Place Type
Bicycle Trips	New Households * Person Trip Generation * % Bike Mode Share by Place Type
Walk Trips	New Households * Person Trip Generation * % Pedestrian Mode Share by Place Type
Vehicle Trips	New Households * Vehicle Trip Generation
VMT	New Households * Vehicle Trip Generation * Average Vehicle Trip Length
Fuel Consumption	VMT * Passenger Car Fuel Efficiency * 365
Building Footprint	Parcel Area * Site Efficiency by Place Type * FAR by Place Type / Number of Stories by Place Type
Annual NOx Emissions	VMT * 1.5 * 365 * 0.0022046226 / 2000
Annual VOC Emissions	VMT * 1.8 * 365 * 0.0022046226 / 2000
Annual CO2 Emissions	VMT * 0.8 * 365 / 2000
Housing Mix	New Households * Single Family Ratio by Place Type, New Households * Townhome Ratio by Place Type, New Households * Apartment Ratio by Place Type
Water Demand	(New Households * Daily Water Usage by Place Type) + (Retail Square Feet * Retail Daily Water Usage per Acre / 43,560) + (Industrial Square Feet * Industrial Daily Water Usage per Acre / 43,560) + (Service Square Feet * Service Daily Water Usage per Acre / 43,560)
Consumed AZGFD Conservation Priority Areas	Sum (Acres of AZGFD where a chip was played)
Consumed Wildlife Corridor	Sum (Acres of Wildlife Corridor where a chip was played)
Proximity to Passive Parks (1/4 mile)	Sum (population within a ¼ mile of passive parks or the FUTS)
Proximity to Active Parks (1/2 mile)	Sum (population within a ½ mile of active parks)



