The Economic Impact of Class I Air Quality Redesignation for the Fond du Lac Reservation, Minnesota

Final Report

A Report Prepared for the

Fond du Lac Band of Lake Superior Chippewa

By

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Executive Summary

The Fond du Lac Band of the Lake Superior Chippewa is considering proposing to the U.S. Environmental Protection Agency (EPA) that the air quality standards aimed at "prevention of significant deterioration" of air quality for the Fond du Lac Reservation be made more stringent by redesignating the Reservation a Class I air quality area under the Clean Air Act. The Clean Air Act (CAA) designated almost all areas in the nation as Class II areas except for National Parks and National Wilderness Areas which were designative Class I areas. The CAA allows state and tribal governments to request redesignation of lands under their jurisdiction to either less strict (Class III) or more strict (Class I) air quality designations for the prevention of significant air quality deterioration. Since 1977 about a half-dozen reservations have requested and obtained such Class I redesignation.

The Fond du Lac Band contracted with Power Consulting to provide an analysis of how Class I redesignation would affect the economic vitality of the Reservation area, including the surrounding counties, and the economic well-being of the residents of that area. In particular, that economic analysis was to focus on the role of clean air in supporting local quality of life and the local recreation economy.

The conceptual and empirical analysis contained in the following report supports the following conclusion with respect to the economic impact of the Fond du Lac Reservation being redesignated as a Class I air quality area.

1. **A half-century of research has demonstrated that protecting and improving air quality protects health, reduces premature death, increases worker productivity, enhanced local quality of life, boosts local property values, and otherwise enhances local economic well-being as well as local economic vitality.**

Air quality is not primarily a matter of aesthetics although it is that too. Air pollution has serious health consequence that lead to chronic illness and premature death. It keeps students out of school and workers absent from work. It degrades water quality and impacts natural systems, threatening wildlife and outdoor recreation activities. It damages infrastructure, equipment, and buildings, increasing maintenance costs and decreasing the working life of property. Ordinary citizens act to avoid higher levels of air pollution by avoiding areas with higher levels of pollution, driving property values down in those areas and depressing local economic vitality.

2. **The available evidence indicates that Class I air quality designation and other efforts to protect and enhance air quality, while improving local health and economic well-being, do not damage local economic vitality.**

The Clean Air Act imposed Class I air quality status on many local areas around the nation, namely those areas with National Parks and National Wilderness Areas. These natural landscapes, of course, also have many more environmental restriction placed

on their use and management in order to protect their natural qualities indefinitely into the future. There is no evidence that these more stringent air quality regulations reduced local economic vitality in the surrounding areas, quite the contrary. National Park and Wilderness counties demonstrate above average economic vitality. Studies of the application of the Clean Air Act to move local areas into compliance with air quality standards also do not suggest that such areas' economic vitality has been retarded or damaged by the air quality restrictions and improvements in local air quality. The permitting of the expansion of metal mining and processing in northeast Minnesota in relatively close proximity to two Class I air quality areas, the Boundary Waters Canoe Wilderness Area and Voyageurs National Park, is evidence that significant economic development, even heavy industrial development, can take place in relatively close proximity of Class I air quality areas if proper pollution control mitigation steps are taken.

3. Structural change in the Fond du Lac Reservation area economy has decreased the likelihood that Class I air quality redesignation would limit economic development in the Reservation area.

The analysis in this report has documented a major shift in the structure of the economy in which the Fond du Lac Reservation is embedded. Paper, wood products, logging, and other manufacturing jobs were cut in half while the overall economy grew significantly. As a result, those manufacturing jobs fell from providing 36 percent of all jobs to providing about 9 percent of jobs. That is, the relative importance of paper, wood products, logging, and other manufacturing fell to a quarter of what it previously had been. Manufacturing real payrolls fell to a third of what they had been forty years earlier. The trend in the relative importance of manufacturing in the Carlton County economy has been steadily downward for over four decades.

Given this 40-year decline in manufacturing activity in the area immediately adjacent to the Fond du Lac Reservation, it is highly unlikely that Class I redesignation of the Reservation would constrain manufacturing activity in Carlton County. That redesignation *could* limit significant increases in air pollution from individual manufacturing firms in areas adjacent to the Reservation. Significant expansions at the paper and wood products facilities, however, would likely involve the deployment of new technologies that would be less pollution intensive than existing operations. For that reason, it is unlikely that the limited Class I increments available under Class I Reservation status would hinder such expansions. Given that the 40-year trend in paper, wood products, and other manufacturing not only in Carlton County but also nationwide has been downward, not upward, Reservation Class I redesignation is highly unlikely to limit manufacturing activities in Carlton County.

Air quality modeling of the addition of very large industrial facilities both east of the Reservation in the Duluth-Superior area and northwest of the Reservation in the Grand Rapids, MN, area has also indicated that such developments would not violate Class I

prevention of significant deterioration limits on the Reservation.[1] The industrial facilities modeled were quite large electric generation plants, far in excess of what any Minnesota utilities have proposed building in the near future. The large electric generation plants whose air pollution was modeled at least partially serve as a representation of what impacts other large industrial facilities at some distance from the Reservation might have on air quality on the Reservation. That modeling indicated that such industrial facilities would not add increments of pollution that exceeded the Class I limits on the Reservation.

4. That same economic transformation of the Reservation area economy has also increased the value of clean air to local economic vitality while decreasing the likelihood that those higher air quality standards would constrain local economic vitality.

The ongoing economic vitality in the Fond du Lac Reservation area has been led by the expansion of economic activities with relatively low air pollution: local government, professional and technical services including health services, resorts and other visitor services, etc. Local economic vitality has also been supported by families that have chosen to live in Carlton County while working elsewhere, including in the Duluth-Superior areas. Carlton County has been attracting both working-age and retirement-age in-migrants, drawn to the area by its social and natural amenities. A high quality environment also encourages visitors to travel to Carlton County for recreation purposes. Protecting and enhancing air quality improves the area's quality of life and its attractiveness as a place to live, visit, and engage in economic activity. In that sense protecting air quality in the Reservation area, assists economic development efforts.

5. Class I air quality redesignation on the Fond du Lac Reservation will not constrain economic development in the Duluth-Superior urban area.

Previous air quality modeling done in support of the Fond du Lac Band's proposed Class I air quality designation has demonstrated that a very large air pollution source located in West Duluth would not violate the Class I air quality increments on the Reservation. The industrial facility modeled, a very large electric generating plant, would emit more of various pollutants relevant to Class I air quality than those coming from the largest existing emitter in the Duluth-Superior area. Compared to other large existing emitters whose rank is just below the top, that air quality modeling assumed a new facility with much higher levels of pollution. Such a new large polluting industrial facility is unlikely to be built in the Duluth-Superior area.

The Duluth-Superior urban area has significantly diversified its economy away from primary reliance on the natural resource and heavy industrial processes that in earlier decades made up its industrial base. Those heavily polluting industrial sectors have been in decline in the region for several decades. The Duluth-Superior economic base is increasingly tied to professional and technical services, including health services,

[1] "Energy Impact Analysis in Support of Class I Redesignation Requests," Air Resource Specialists, Inc., prepared for the Fond du Lac Band of Lake Superior Chippewa.

institutions of higher education, regional trade center functions, and a growing visitor economy. A different type of relatively high-tech manufacturing, such as aero-space equipment, has also been developing. Individual new facilities associated with these growing sectors of the Duluth-Superior urban economy will not produce air pollution in volumes sufficient to threaten the air quality increments associated with Class I status on the Reservation.

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About the Authors:

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I. Class I Air Quality Designation of the Fond du Lac Reservation: An Introduction

The Fond du Lac Band of the Lake Superior Chippewa is considering proposing to the U.S. Environmental Protection Agency (EPA) that the air quality standards aimed at "prevention of significant deterioration" of air quality for the Fond du Lac Reservation be made more stringent by redesignating the Reservation a Class I air quality area under the Clean Air Act. The Clean Air Act (CAA) designated almost all areas in the nation as Class II areas except for National Parks and National Wilderness Areas which were designative Class I areas. The CAA allows state and tribal governments to request redesignation of lands under their jurisdiction to either less strict (Class III) or more strict (Class I) air quality designations for the prevention of significant air quality deterioration. Since 1977 about a half-dozen reservations have requested and obtained such Class I redesignation.

Under the Clean Air Act the Prevention of Significant Deterioration (PSD) program seeks to protect air quality in areas that meet the national ambient air quality standards. The purpose of setting maximum pollution levels, however, was not to allow all areas of the nation that met those standards see their air quality deteriorate to those levels. Instead, limits were placed on the additional pollution that would be allowed in an area, limits that were below the maximum nationwide levels. Class I redesignation would allow smaller increments of additional pollution than Class II would, thus assuring a higher level of air quality.

1. Focusing on Local Quality of Life and the Visitor Economy

The Fond du Lac Band contracted with Power Consulting to provide an analysis of how Class I redesignation would affect the economic vitality of the Reservation area, including the surrounding counties, and the economic well-being of the residents of that area. In particular, that economic analysis was to focus on the role of clean air in supporting local quality of life and the local recreation economy.

This focus on the quality of life and the recreation economy is tied to the recognition in the Reservation area that protecting local quality of life is a dominant concern in assuring local economic well-being and local economic vitality.

The Reservation is almost equally divided between Carlton and St. Louis Counties. St. Louis County, however, is the largest county in Minnesota by geographic size and one of the largest in terms of population because the capital of the county, Duluth, is the second largest metropolitan area in the state. The Fond du Lac Band Reservation's area in St. Louis County is a tiny sliver of St. Louis County. In addition to being a part of a metropolitan area encompassing not only the city of Duluth but also its twin city, Superior, in Wisconsin, St. Louis County is one of the largest metal mining areas in the

United States. Because of these differences and others that we will discuss below between Carlton County and the Reservation (including the part in St. Louis County) and the whole of St. Louis County, our analysis will use Carlton County, the county where a majority of the Fond du Lac Reservation is located and an even larger majority of the Reservation's population lives, as a proxy for the larger geographic region in which the Reservation is embedded. This, in our judgment, provides a better representation of the small cities and rural areas that characterize the area surrounding the Fond du Lac Reservation. The fact that detailed economic information is only available down to the country level almost forces us to make this decision. We cannot analyze just the small Reservation part of St. Louis Country adjacent to Carlton County or just southern St. Louis County. Detailed socioeconomic data simply is not available at that small geographic scale.

We use the *Carlton County Community-Based Comprehensive Plan*[2] to document the wide commitment to putting quality of life at the center of local economic development policy. The *Carlton County Community-Based Comprehensive Plan* begins with a "Vision Statement" that states that "Carlton County is an area in which all residents enjoy a high quality of life" and that the point of the Comprehensive Plan was to "ensure that residents…will sustain this high quality of life for many years to come." (p. 5)

The Carlton County Comprehensive Plan went on to list its goals. Those goals that focused specifically on the preferred character of county development included the following:

- Sustainable uses of natural resources
- Maintenance of high water quality in its lakes, wetlands, and waterways.
- Protection of native wildlife, plants, and their communities.
- Sustainable management of forests.
- Encouragement of a variety of land use types within the county so as to enhance quality of life and environment of Carlton County.

These goals were listed before the goal of "development of a strong and diversified economic base that would promote job growth and increase the tax base." The latter was the eleventh goal listed. It was followed by the "development of agriculture as a viable part of a diverse economy and maintenance of the rural settlement characteristics of agricultural areas. (p. 8)

The Carlton County Comprehensive Plan, in its discussion of economic development, listed twelve "economic assets and opportunities" for Carlton County including (p. 78):

- Proximity to Lake Superior (2nd)
- Natural Forest Environment (4th)

[2] April 2001, prepared by the Carlton County Joint Powers Board with assistance from the Arrowhead Regional Development Commission. The Joint Powers Board had representatives of all of the political jurisdictions in Carlton County including the Fond du Lac Reservation.

- The State Scenic Byways of Rushing Rapids Parkway (Hwy 210) and Veterans' Evergreen Memorial Scenic Drive (Hwy 23) (6th)
- State Parks and Forests (7th)
- State Trails (8th)
- Tourist Attractions (9th)
- Recreational Opportunities (10th)

Note that seven of the twelve "economic assets and opportunities" were tied to natural landscape features or recreational opportunities.

Finally, the Carlton County Comprehensive Plan discussed six strategies for economic development. These included planning and organizational efforts, development of telecommunications and technology hubs, and supporting existing as well as new businesses. One of those half-dozen strategies was to "recognize tourism and recreation as a viable part of a diversified economy." (p. 84)

At the same time that Carlton County, with the participation of the Fond du Lac Band, was developing its Comprehensive Plan, the Fond du Lac Band was applying to the U.S. Environmental Protection Agency for Treatment as an Affected State to supervise the application of the Clean Air Act on the Reservation.[3] The Band emphasized the importance of protecting the natural environment for the well-being of the Band and other residents of the Reservation.

> "The FDL Reservation has predominant populations of white tail deer, black bear, ruffed grouse, and various species of waterfowl. It is also home to such animals as river otter, pine marten, fisher, moose, gray wolf, bald eagle, osprey, great gray owl, and northern boreal owl. There are 3,850 enrolled tribal members, with a Band member reservation population of 1,353. A substantial number of non-tribal members also reside on the Reservation, bringing the total reservation population to 3,728 persons. The Reservation provides an environment for the cultural and spiritual well-being of the Fond du Lac people, as well as hunting, fishing, trapping, and gathering, which are, in general, of greater importance to Indian people than to the general public."

The Fond du Lac Band is also very proud of its water quality program. The Band secured TAS status under the Clean Water Act to administer a water quality standards program in 1996, and developed its own water quality standards with designated uses such as fishing, recreation, cultural, and wild rice production. Those water quality standards were extensively reviewed for consistency not only with national standards, but also with the Great Lakes Initiative standards, and approved by EPA Region 5 in 2001. Since 1998, the Band has conducted a comprehensive water quality monitoring program of the Reservation lakes, streams, and the St. Louis River, to assess

[3] Proposal to Air and Radiation Division, Region V, USEPA, Fond du Lac Tribal Air Program Development Request for Treatment as an Affected State, April 2002, Fond du Lac Reservation Environmental Program.

attainment or impairment relative to their designated uses, to identify water bodies in need of restoration or special protections, and to develop new criteria. The Band has completed one required triennial review, and is initiating its second water quality standards review process, with potential revisions to include numeric nutrient and biological criteria. Along with water quality standards, the Band also has authority to certify federal actions such as wetlands dredge and fill permits or National Pollutant Discharge Elimination System water discharge permits under Section 401 of the Clean Water Act.

Other reservation water resource protection tools are a Joint Comprehensive Wetland Protection and Management Plan, a draft Aquatic Resources Protection and Management Ordinance, a Wellhead Protection Plan for the community wells, and a Source Water Protection Plan. Another special feature of the Fond du Lac Reservation is the abundance of undisturbed, high quality wetlands. The Reservation contains areas of forested, scrub shrub, emergent, and aquatic bed wetlands. Wetlands are important for water quality protection; flood and storm water retention; wildlife and fish habitat; shoreline protection; groundwater interaction; aesthetic, recreational, educational, cultural, and scientific opportunities; and crop production. Several years ago the Fond du Lac Band began a wetland monitoring program, and is developing a Wetland Restoration Plan to identify and prioritize opportunities for wetland mitigation, enhancement, and restoration.

Clearly the Fond du Lac Band and the local governments in Carlton County have recognized the importance of protecting the amenities associated with the natural, cultural, and social environment of the Reservation and in the area surrounding the Reservation. This is not “just” an aesthetic or cultural concern but a concern about local economic well-being and vitality. That focus has guided the analysis that follows of the economic impact of Class I redesignation for the Reservation. We also focus on local quality of life and the local amenities that attract both new permanent residents and visitors.

2. Organization of This Report

We begin with a discussion of what we know about the economic value and economic impacts of protecting air quality. Because the Clean Air Act mandated Class I air quality status only for National Parks and National Wilderness Areas, we look at what evidence there is of negative impacts on local economic vitality across the nation from those mandatory Class I designations. We then look at the how “people voting with their feet” as they pursue cleaner air indicate to us the value they place on cleaner air. This has been studied for a good part of a half-century and the results are impressive in terms of what ordinary citizens are willing to pay for cleaner air. We also look more broadly at the benefits and costs associated with enforcement of the more recent (1990) amendments to the Clean Air Act. That analysis indicates that the benefits associated with cleaner air far exceed the very modest costs associated with complying with the stricter limits on air pollution emissions. We conclude with a summary of what we know about the impacts of air quality regulation on local economic well-being and local economic vitality.

Because, to some, the results of the first section will seem counter-intuitive and in conflict with the conventional wisdom that environmental protection carries with it a high price tag, the second section of this report focuses on how we think about the local economy and the forces that drive it. It is errors in that understanding that often lead to very negative expectations from efforts to improve environmental quality, expectations that usually are not borne out by the facts. Both popular and professional local economic analysis often takes an "export base" view that effectively assumes that "only exports matter." Although there is an element of truth contained in that economic perspective, it is far too narrow a perspective to deal with a modern economy. That narrow focus on exports has to be broadened to look at the "total economy," including what it is that draws residents and businesses to areas and what it is that helps a local economy capture, hold, and re-circulate income that flows in from the outside. We also have to look more broadly at *all* of the sources of income flowing into the local economy.

We then explain why we have chosen to use Carlton County to represent the Fond du Lac Reservation area rather than including both Carlton County and St. Louis County where parts of the Reservation are located or the entire Duluth Metropolitan Area which includes not only St. Louis and Carlton Counties in Minnesota but also Douglas County, WI, where the city of Superior is located.

Using Carlton County as the "local area," we then discuss the limits of an "exports-only" view of the forces driving the local economy before discussing the "new sources of economic vitality" found in the local economy in which the Fond du Lac Reservation is embedded. We provide a snap-shot of the current Carlton County economy and then discuss the sources of local economic vitality as well as the declining sectors that have been burdening the Reservation area economy. We conclude that section with a discussion of the economic importance of local environmental amenities in attracting and holding businesses, working-age residents, retirees, and visitors. This brings us full circle to an explanation of why Class I air quality designation has not served as a barrier to local economic vitality around National Park and Wilderness Areas. It also helps explain why the local economic impacts of environmental regulation have been so much less than those who opposed protecting environmental quality originally forecast.

3. Conclusions Reached

The conceptual and empirical analysis provided below supports the following conclusions about the economic impact of the Fond du Lac Reservation being redesignated as a Class I air quality area.

i. The available evidence indicates that Class I air quality designation and other efforts to protect and enhance air quality, while improving local health and economic well-being, do not damage local economic vitality.

The Clean Air Act imposed Class I air quality status on many local areas around the nation, namely those areas with National Parks and National Wilderness Areas. These natural landscapes, of course, also have many more environmental restrictions placed

on their use and management in order to protect their natural qualities indefinitely into the future. There is no evidence that these more stringent air quality regulations reduced local economic vitality in the surrounding areas, quite the contrary. National Park and Wilderness counties demonstrate above average economic vitality. Studies of the application of the Clean Air Act to move local areas into compliance with air quality standards also do not suggest that such areas' economic vitality has been retarded or damaged by the air quality restrictions and improvements in local air quality.

ii. A half-century of research has demonstrated that protecting and improving air quality protects health, reduces premature death, increases worker productivity, enhanced local quality of life, boosts local property values, and otherwise enhances local economic well-being as well as local economic vitality.

Air quality is not primarily a matter of aesthetics although it is that too. Air pollution has serious health consequence that lead to chronic illness and premature death. It keeps students out of school and workers absent from work. It degrades water quality and impacts natural systems, threatening wildlife and outdoor recreation activities. It damages infrastructure, equipment, and buildings, increasing maintenance costs and decreasing the working life of property. Ordinary citizens act to avoid higher levels of air pollution by avoiding areas with higher levels of pollution, driving property values down in those areas and depressing local economic vitality.

iii. Structural change in the Fond du Lac Reservation area economy has decreased the likelihood that Class I air quality redesignation would limit economic development in the Reservation area.

The analysis in this report has documented a major shift in the structure of the economy in which the Fond du Lac Reservation is embedded. Paper, wood products, logging, and other manufacturing jobs were cut in half while the overall economy grew significantly. As a result, those manufacturing jobs fell from providing 36 percent of all jobs to providing about 9 percent of jobs. That is, the relative importance of paper, wood products, logging, and other manufacturing fell to a quarter of what it previously had been. Manufacturing real payrolls fell to a third of what they had been forty years earlier. The trend in the relative importance of manufacturing in the Carlton County economy has been steadily downward for over four decades.

Given this 40-year decline in manufacturing activity in the area immediately adjacent to the Fond du Lac Reservation, it is highly unlikely that Class I redesignation of the Reservation would constrain manufacturing activity in Carlton County. That redesignation *could* limit significant increases in air pollution from individual manufacturing firms in areas adjacent to the Reservation. Significant expansions at the paper and wood products facilities, however, would likely involve the deployment of new technologies that would be less pollution intensive than existing operations. For that reason, it is unlikely that the limited air quality deterioration incremental increases available under Reservation Class I status would hinder such expansions. Given that the

40-year trend in paper, wood products, and other manufacturing not only in Carlton County but also nationwide has been downward, not upward, Reservation Class I redesignation is highly unlikely to limit manufacturing activities in Carlton County.

Air quality modeling of the addition of very large industrial facilities both east of the Reservation in the Duluth-Superior area and northwest of the Reservation in the Grand Rapids, MN, area has also indicated that such developments would not violate Class I prevention of significant deterioration limits on the Reservation.[4] The industrial facilities modeled were quite large electric generation plants, far in excess of what any Minnesota utilities have proposed building in the near future. The large electric generation plants whose air pollution was modeled at least partially serve as a representation of what impacts other large industrial facilities at some distance from the Reservation might have on air quality on the Reservation. That modeling indicated that such industrial facilities would not add increments of pollution that exceeded the Class I limits on the Reservation.

iv. That same economic transformation of the Reservation area economy has also increased the value of clean air to local economic vitality while decreasing the likelihood that those higher air quality standards would constrain local economic vitality.

The ongoing economic vitality in the Fond du Lac Reservation area has been led by the expansion of economic activities with relatively low air pollution: local government, professional and technical services including health services, resorts and other visitor services, etc. Local economic vitality has also been supported by families that have chosen to live in Carlton County while working elsewhere, including in the Duluth-Superior areas. Carlton County has been attracting both working-age and retirement-age in-migrants, drawn to the area by its social and natural amenities. A high quality environment also encourages visitors to travel to Carlton County for recreation purposes. Protecting and enhancing air quality improves the area's quality of life and its attractiveness as a place to live, visit, and engage in economic activity. In that sense protecting air quality in the Reservation area, assists economic development efforts.

v. Class I air quality redesignation on the Fond du Lac Reservation will not constrain economic development in the Duluth-Superior urban area.

Previous air quality modeling done in support of the Fond du Lac Band's proposed Class I air quality designation has demonstrated that a very large air pollution source located in West Duluth would not violate the Class I air quality increments on the Reservation. The industrial facility modeled, a very large electric generating plant, would emit more of various pollutants relevant to Class I air quality than those coming from the largest existing emitter in the Duluth-Superior area. Compared to other large existing emitters whose rank is just below the top, that air quality modeling assumed a new

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facility with much higher levels of pollution. Such a new large polluting industrial facility is unlikely to be built in the Duluth-Superior area.

The Duluth-Superior urban area has significantly diversified its economy away from primary reliance on the natural resource and heavy industrial processes that in earlier decades made up its industrial base. Those heavily polluting industrial sectors have been in decline in the region for several decades. The Duluth-Superior economic base is increasingly tied to professional and technical services, including health services, institutions of higher education, regional trade center functions, and a growing visitor economy. A different type of relatively high-tech manufacturing, such as aero-space equipment, has also been developing. Individual new facilities associated with these growing sectors of the Duluth-Superior urban economy will not produce air pollution in volumes sufficient to threaten the air quality increments associated with Class I status on the Reservation.

II. The Economic Value and Local Economic Impact of Protecting Air Quality

1. The Impacts of Class I Air Quality Designations under the Clean Air Act

The Clean Air Act mandated that all National Parks and larger federally classified National Wilderness Areas be designated Class I air quality areas. All other areas were assigned Class II air quality status as the default designation. However, states and American Indian Reservations were authorized to seek an alternative designation for lands under their jurisdiction, either higher air quality (Class I) or lower air quality (Class III).

The designation of all National Parks and National Wilderness Areas as Class I provides a natural experiment of sorts to see what the impact of such stricter air quality regulations as well as the many other restrictions on commercial and non-commercial activities associated with National Parks and Wilderness have on local economic vitality. The conventional wisdom is that by limiting the commercial use of landscapes and their air and water for waste disposal purposes a broad range of economic activities will be blocked or become so expensive as to not be feasible. This, it is assumed, will reduce the local level of economic activity and reduce employment and income opportunities. That in turn will make local households and individuals poorer or force the out-migration of some residents because of the limited economic opportunities available locally. In any case, it is assumed that local economic vitality will be reduced by the stricter control of the used of the landscape, air, water, wildlife, etc.

Although this is certainly a conceptual possibility, this line of reasoning assumes that higher air and water quality and protected landscapes and wildlife are not valuable to local residents and businesses. That is, it assumes that the restrictions on the use of land, air, and water are economically irrational in the sense that the value of the

protected qualities does not justify the stricter protection. If residents and businesses find the protected qualities valuable, they may be drawn to areas with stricter environmental protection, partially or entirely offsetting any reductions in economic opportunities due to that stricter regulation of economic activities. That, of course, is an empirical question that cannot be settled conceptually. One has to study how people and businesses actually respond to regulations that protect air, water, landscapes, and wildlife as well as human and ecosystem health.

The higher level of environmental protection afforded National Parks and Wilderness, environmental regulations that extend far beyond Class I air quality restrictions, provides an opportunity to test the impact of some of the most stringent levels of environmental protection. National Parks limit private economic activity quite severely; hunting is prohibited; permits are usually required for remote camping and activities off of designated trails. Similarly with wilderness areas: No motorized or even mechanized travel is allowed and no motorized equipment can be used with in the wilderness. In addition new human structures are banned. Hunting is allowed although mechanical devices cannot be used to remove the game. Indian lands with Class I air quality designations have no such restrictions placed on how their land is used and the activities that can take place there except for those necessary to meet the higher air quality standards. It is in that sense that National Parks and Wilderness Areas represent a much more extreme test of the impact of environmental restrictions on regional economic vitality.

A general review of various measures of local economic vitality in the counties containing large National Parks or units of the National Wilderness Preservation System does not suggest that these protective landscape preservation measures have hurt local economic vitality, quite the contrary. Communities adjacent to these areas that have received the highest level of environmental protections show much higher levels of economic vitality, not lower levels.

A 2001 study by the authors analyzed various indicators of local economic vitality for all counties in the lower forty-eight states in which large National Parks were located.[5] "Large" was defined as parks with at least 250,000 acres. There were 22 such parks located in 45 counties. The indicators of local economic vitality that were used were growth in population, employment, real per capita income, and aggregate real income. Since most large National Parks are not found in densely settled urban areas, the economic vitality of these National Parks counties was compared to the overall economic vitality of all non-metropolitan counties in the US.

The results of this comparison clearly demonstrated that the National Park counties had much higher levels of economic vitality, with rates of growth of population, employment, and real income two to four times higher than found in non-metropolitan counties as a whole. See Table 1. Whatever the impact of the stricter environmental restrictions on

[5] *The Economic Impact of the Proposed Maine Woods National Park & Preserve,* Thomas Michael Power, prepared for RESTORE: The North Woods, September 2001.

air, water, land, and wildlife use, it did not appear to be retarding local economic vitality.[6]

An analysis of the other mandatory Class I air quality regions, units of the National Wilderness Preservation System, also indicates higher levels of economic vitality compared to all non-metropolitan areas. Over the last half-century, the population growth rates in National Wilderness counties has been two to six times that of non-metropolitan counties as a whole. The decade by decade comparison between 1950 and 2000 is shown in Figure 1. For the period as a whole, population growth rates in the Wilderness Counties were almost five times those in non-metro counties as a whole.[7]

Table 1

Economic Vitality in the Regions Surrounding 22 Large National Parks				
All Counties Associated with National Parks Greater Than 250,000 acres				
Measure	Percentage Change		Percentage Change	
of			Relative to US	
Economic Vitality	89-98	69-98	89-98	69-98
Population	24%	135%	2.5	3.9
Jobs	34%	205%	2	2.7
Aggregate Real Income	37%	255%	1.7	2.2
Real Per Capita Income	11%	52%	0.9	0.9

Of course, just as National Parks and Wilderness Areas impose more restrictions than just Class I air quality regulations, they also protect a broader range of environmental values than just air quality. It is the mix of both the environmental restrictions and the value of the environmental amenities protected that determine the net impact on local economic vitality and well-being. In the following discussions we will focus more directly on the economic impacts of regulating air emissions to protect local air quality.

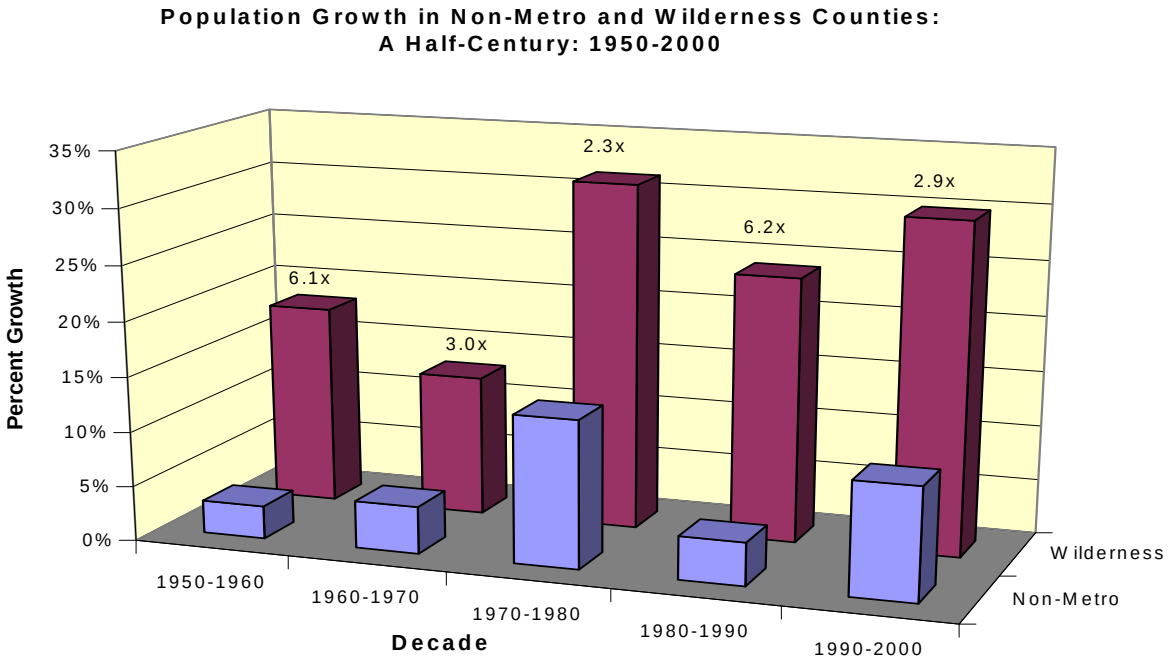
Because the economy of northeastern Minnesota where Voyageurs National Park and the Boundary Waters Canoe Wilderness Area are located has been tied to the cyclical

[6] Ibid. Chapter III, The Role of National parks in Promoting Local Economic Vitality. It will be noted that in the table above, per capita income *was* somewhat lower in the National Park counties. This is what economists would expect in areas that are attractive residents. They will draw a somewhat excess labor supply that is willing to sacrifice a certain amount of income to be able to gain access to the higher local quality of life. Local home prices and the local cost of living may also be higher, another cost of gaining access to valuable local amenities.

[7] "The Impact of Wilderness and Other Wildlands on Local Economies and Regional Development Trends," Gundars Rudzitis and Rebecca Johnson, in McCool, Stephen F. et al. *Wilderness Science in a Time of Change Conference—Volume 2: Wilderness within the Context of Larger Systems,* RMRS-P-15-VOL 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 2000. Table 1, page 15.

forest products and metal mining industries, it is difficult to say anything definitive about the impact that each of these protected areas had on the local economy since they were granted protection (1964 for Boundary Waters and 1975 for Voyageurs). Nationwide employment in forest products and metal mining has plunged as labor-displacing technological change has reduced the need for workers and international competition has displaced significant parts of the United States steel and forest products industry. What can be said is that despite the Class I air quality status of both of these areas stretching across the entire border of northeastern Minnesota with Canada, the iron industry is rebounding from the previous and current recessions as world steel production has boomed. Copper, nickel, and precious metal mining may also be developed in Minnesota for the first time.

Figure 1



1950-2000: Growth in Wilderness = 4.6 X Growth in Non-Metropolitan

There have also been significant new metal operations that have developed recently in northeastern Minnesota. The Mesabi Nugget facility that converts the taconite ore into almost pure iron nuggets began operation in the Aurora-Hoyt Lakes area in 2009. Essar Steel Minnesota has been constructing a slab steel production facility in Itasca County near Nashwauk. Also in Itasca County Minnesota Power has recently completed a refurbishing of one of its Boswell Energy Center units at Cohasset to improve its pollution control capacity. A variety of copper-nickel-gold mining operations are also on the drawing boards in northeast Minnesota.

As a result of this actual and planned industrial activity in the region, the Minnesota Department of Employment and Economic Development in May 2011 was projecting that northeastern Minnesota would see the second fastest employment growth of all of Minnesota's economic regions over the coming decade, 2009-2019. The region was projected to grow faster than the state as a whole as well as the Minneapolis metropolitan region over the next ten years. This, if it takes place, would be an impressive turn around since the northeast, like the state as a whole and the Minneapolis area, actually experienced employment declines during the last decade, 1999-2009. Clearly Minnesota state economists do not expect the Class I air quality standards along the northern border of the state to prevent significant mineral development from taking place in the Iron Range.

Air quality modeling confirms that additional industrial development is consistent with meeting Class I air quality standards. In 2000, Northshore Mining Company, in support of its proposal to build a direct reduction iron facility at its taconite processing facility at Silver Bay on Lake Superior analyzed the impact of that facility on four Class I areas, one as close as 32 miles (Boundary Waters Canoe Wilderness) and another 100 miles away (Isle Royale National Park in Lake Superior). The other Class I areas considered were Voyageurs National Park in northern Minnesota and Rainbow Lake Wilderness Area in Bayfield County, Wisconsin. That study found that the project would meet the respective regulatory and guideline values for air quality increment, acid deposition, mercury deposition, and visibility analyses for Class I areas located 30 to 100 miles from the facility.[8]

The Fond du Lac Band also commissioned an air quality study of the impact of a large industrial facility being located 25 miles to the east of the Reservation in the Duluth area as well as 45 miles to the northwest near Grand Rapids in the Iron Range. The facilities were very large electric generators, a natural-gas fired facility in the Duluth area and a coal-fired facility in the Grand Rapids area. The analysis sought to see if such a facility would lead Class I air quality standards on the Reservation to be violated. The study concluded that "neither project would interfere with maintaining the Class I PSD increments on the Fond du Lac Reservation."[9]

[8] Class I Area Impacts Analyses for a Proposed Expansion of a Taconite Processing Facility in Northeast Minnesota," Dennis M. Wagner, et al. a paper prepared for a meeting of the Society of Mining Engineers, Barr Engineering Company, http://www.barr.com/PDFs/Papers/Class_I_impacts.pdf

[9] "Energy Impact Analysis in Support of Class I Redesignation Requests," Air Resource Specialists, Inc., May 2011.

2. The Economic Value of Clean Air

Air pollution can, among other things, drastically change visibility by creating a haze that blocks or obscures vistas and generally diffuses sunlight. The chemical content of the pollution can also cause discomfort, making the eyes smart and water. Worse still, air pollution can damage the bronchia and lungs and stress the cardiovascular system leading to a variety of debilitating diseases and, ultimately, premature death.

These impacts, from obscuring scenic vistas to causing annoying irritations to seriously damaging health, have been widely recognized by average citizens and, where possible, that air pollution is systematically avoided by people at substantial cost to themselves. This can be seen in how people treat air pollution when they go about purchasing or renting a place to live. Consider the Los Angeles area, famous for its air pollution. Not all of the metropolitan area suffers equally from the pollution. Because of the city's rolling terrain and the presence of the Pacific Ocean, some neighborhoods regularly have good air quality while others suffer. This allows a pairing of neighborhoods with similar housing and socioeconomic and community characteristics but significant differences in air quality. Statistical analysis can then be carried out to isolate the impact of air quality on property values when other characteristics of the property such as crime rates, housing density, age of house, income levels, etc. are held constant.

Economists have been studying the damage done by air pollution for many decades. We start with studies going as far back as the late 1970s using data from the 1960s. We then jump ahead to more recent studies. All document the economic value of clean air, not as judged by environmental advocates or government agencies, but as indicated by the actual economic sacrifices ordinary people make to escape air pollution.

A 1995 study provided a review of twenty-five studies of the impact of air quality on property values.[10] These analyses indicate that, when buying housing in higher-income neighborhoods, families were willing to pay the equivalent of about $587 per month more for better air; for lower-income neighborhoods, the figure was about $170 per month for the same air-quality improvement.[11] The air-quality improvement represented a reduction of about 60 percent in both nitrogen dioxide and suspended particulate. If one assumes that low-income folks have the same ability to enjoy clean air as their more affluent fellow citizens but simply do not have the income to express that desire as strongly when bidding in housing markets, then the value of clean air in the high-income neighborhoods might be taken as indicating the relative economic importance of clean air when income does not limit expression of that importance. In a public-policy setting where access to clean air is at stake, this higher value may be the most appropriate one to use. To do otherwise could lead the benefit cost ratio for cleaning up air in high

[10] V.K. Smith and J. Huang, “Can Markets Value Air Quality? A Meta-Analysis of Hedonic Property Value Models,” *Journal of Political Economy* 103(1):209-227, 1995.
[11] D.F. Brookshire et al. “Valuing Public Goods: A Comparison of Survey and Hedonic Approaches.” *American Economic Review*. 72(1): 165-177. 1982. Values restated in 2010 dollars.

income neighborhoods to be much higher than that associated with cleaning up the air in lower income neighborhoods. That would raise questions of environmental justice where more heavily polluting activities were approved in poor neighborhoods but rejected for higher income neighborhoods or enforcement efforts were focused on affluent neighborhoods than on poor neighborhoods.

The Los Angeles region has become a symbol of an affluent lifestyle built around materialism and commercialism. Yet Southern Californians have been willing to spend considerable shares of their income pursuing cleaner air: $587 per month is $7,000 per year and $210,000 over the life of a 30-year mortgage! Clean air obviously has considerable economic value to these people, and presumably, to most of the rest of the population.

Analysis of property values in various parts of Boston revealed a similar pattern. The less pollution, all other things held constant, the more homebuyers are willing to pay for homes of similar character and quality. In heavily polluted neighborhoods, the data indicate that high-income households would be willing, on average, to pay $17,000 in high home purchase costs for an 11 percent reduction in pollution. Low-income households were willing to pay $8,600 for the same reduction.[12]

Instead of determining what people are willing to pay in higher property values to obtain cleaner air, we can analyze the way salary levels for highly mobile occupations vary geographically with the level of air quality, all other things again being held constant. One such study analyzed university professors' salaries. Because the market for university professors is a national one that provides job opportunities to do similar teaching and research at literally thousands of different institutions of higher education, this is a highly mobile group of workers. The study adjusted statistically for the character of the school, the characteristics of the town besides air pollution, and the experience and characteristics of the professor. It then isolated the impact of different levels of air pollution on salaries, calculating the additional income that would have to be provided to the average professor to compensate her or him for lower levels of air quality. In areas with high air quality, a full professor would require, on average, $4,600 per year to accept a significant increase in pollution, an increase equal to the average variation in pollution levels across the nation. Assistant professors would require on average $2,300 per year to accept that sort of deterioration in air quality.[13] An analysis of a much broader range of jobs in urban areas indicated that workers in St. Louis would be willing to pay close to $3,700 per year to obtain a 30 percent reduction in sulfur dioxide in the ambient air.[14]

If these older results are applied to all American households or workers, we are clearly talking about improved air quality being worth hundreds of billions of dollars nationwide.

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[12] D. J. Harrison and D.L. Rubinfeld. “Hedonic Housing Prices and the Demand for Clean Air.” *Journal of Environmental Economics*. 5: 81-102. 1978.
[13] M. Bayless. “Measuring the Benefits of Air Quality Improvements: A Hedonic Salary Approach.” *Journal of Environmental Economic and Management*. 9: 81-99. 1982.
[14] M.L. Cropper. “The Value of Urban Amenities.” *Journal of Regional Science*. 21(3): 359-374. 1981.

More recent studies have focused on the question of whether adopting more stringent air quality standards has a negative impact on local economic vitality. In 1996 Michael E. Porter wrote an influential article that concluded that environmental regulation did not reduce the economic competitiveness of firms and regions subject to more stringent regulation.[15] What became the "Porter Hypothesis" argued that firms react in an entrepreneurial fashion to higher pollution regulations. Those regulations force them to study their production processes and retool. In doing so, their innovations and investments not only reduce pollution emissions but also increase the productivity of their overall production processes, actually increasing their competitiveness. This is not a startling result. Economists have long argued that competition among firms does not just force firms out of business because their profit margins have been reduced. That competition also forces all firms to innovate and find new ways of reducing costs and improving quality so that they can survive. The "Porter Hypothesis" simply extends that response to pressures on profits from environmental regulations too.

An economics doctoral dissertation in 2009 found confirmation of this hypothesis in a county-level study of 410 Appalachian counties in 12 states between 1992 and 2007. The study analyzed the impact of changes in the stringency of US EPA air pollution regulation on county economies. When communities are found to be in violation of federal air quality standards, EPA more closely monitors pollution control efforts until those areas cease to be "non-attainment" areas. The study looked at what the impact of that higher level of enforcement of air pollution control standards was on local population, employment and income. The study concluded that: "We find robust evidence that shows that changes in [more stringent] environmental regulations positively influence changes in population, total employment, and per capita income. Thus we parsimoniously conclude that in the long-run, environmental regulations are not detrimental to economic growth."[16]

Another recent study (2009) focused on the "birth" of new industrial facilities by county found that the impact of the higher EPA regulation that accompanies an area being in "non-attainment" of Clean Air Act standards was very small across all plants in the non-attainment counties. The impact of that higher level of environmental regulation *did,* however*,* have a significant impact on high-polluting firms such as petroleum refineries, iron, steel, and paper mills, and glass and wood products manufacturing firms. For all firms, the number of new firms was reduced by only 4 percent due to the more stringent regulation, but for high-polluters, the number of new firms was cut in half. But these

[15] "Toward a New Conception of the Environmental-Competitiveness Relationship," Michael E. Porter and Claas van der Linde, *Journal of Economic Perspectives* 9(4):97-118., 1996.
[16] *An Empirical Analysis of the Interactions between Environmental Regulations and Economic Growth,* Chali Nondo, College of Agriculture, Natural Resources and Design, West Virginia University, 2009. A research paper of the same title summarizes the results of this PhD dissertation. The research paper was co-authored by Chali Nondo, Peter V. Schaeffer, Tesfa G. Gebremedhin, and Jerald J. Fletcher. Research Paper 2010-13. The quote is from the abstract of the working paper.

high-polluting firms represented only about 8 percent of all new firms.[17] So the vast majority of firms were not affected.

Growing areas in the United States have shown themselves to be quite flexible in avoiding adopting technologies that burden the growing areas with high levels of pollution. In addition, mobile households have tended to move away from high pollution areas to lower pollution areas. The results of this dynamic are that the exposure of the general population to the air pollution coming from coal fired power plants has been significantly reduced. The electric generation serving growing regions tends to either not burn coal or build coal-fired generators that are more efficient and cleaner. As a result, relatively lower air pollution levels have been compatible with ongoing economic growth.[18]

The impact of high pollution levels inhibiting county population growth and the growth that followed when pollution regulation reduced pollution has been documented in the counties surrounding Los Angeles. The study focused on the twenty-year period from 1980 to 2000. Over that time period environmental regulation sharply reduced pollution levels in some of the Los Angeles suburbs. Those suburbs that experienced the largest pollution reductions saw population growth "soar."[19] Analysis of all of the explanations that might explain that population growth such as reductions in crime rates, improvements in commuting times to work, changes in relative housing costs, and overall growth in the Los Angeles metropolitan economy were analyzed along with changes in pollution levels. The conclusion was that:

> Quality of life is an important determinant of household location patters. If a location's quality of life improves, it may experience population growth and increasingly attract migrants who chose not to live there in the past. In this paper I argue that high ozone levels in the Los Angeles suburbs have played a role in discouraging growth in the areas. As Clean Air Act regulation reduced smog problems, the Los Angeles suburban counties became increasingly attractive places to live. Cheap land and access to higher quality of life have encouraged in-migration.

Of course, the opposite scenario is also possible: Air quality is allowed to deteriorate and the population moves away because of that, crippling the local economy.

Economists continue to study the impact of polluting facilities on housing values and the character of neighborhoods. A 2010 paper studied the impact of a power plant opening in a neighborhood in the United States during the 1990s. A total of 92 power plant locations were studied along with the approximately 205,000 housing units within two

[17] "The Effects of Air Quality Regulations on the Location of Pollution Intensive Manufacturing Plants," S. Condliffe and O.A. Morgan, *Journal of Regulatory Economics*, 36(1):83-93, 2009.
[18] "Regional Growth and Exposure to Nearby Coal Fired Power Plant Emissions," Matthew E. Kahn, *Regional Science and Urban Economics,* 39(1):15-22, 2009.
[19] "Smog Reduction's Impact on California County Growth," Matthew E. Kahn, *Journal of Regional Science*, 40(3):565-582, 2000, pp. 265 and 279.

miles of the location of those plants. Compared to neighborhoods with similar housing and demographic characteristics, neighborhoods within two miles of plants experienced a 3 to 7 percent decrease in housing values and rents with some evidence of larger decreases in property values within one mile and for larger capacity plants. Neighborhoods close to the plants also changed. There were modest but statistically significant decreases in mean household income, educational attainment, and the proportion of homes that were owner occupied.[20]

A 2008 study used the federal requirement that industrial facilities report their releases of chemicals which then are reported in the Toxics Release Inventory (TRI). The study sought to see how residents of relatively small neighborhoods within a particular metropolitan area reacted to their neighborhood having a facility making such toxic releases or the closing of a facility that had been making such releases. Economic theory would suggest that areas where such toxic releases increased would lose population and that the population remaining would tend to shift towards having lower incomes as the higher income residents moved out. The opposite should be true of areas where toxic emissions had decreased or ended. They should gain population and the average income of the population should rise.

This study focused on migration *within* a metropolitan area, from one neighborhood to another. This type of migration is less costly and risky to residents since they do not necessarily have to change jobs, leave existing support systems, or move to a largely unknown economy and social setting. The study found that people did in fact "vote with their feet" in responses to changes in pollution levels. They tended to move away from areas where pollution was increasing and towards areas where pollution had decreased. In addition there was also some evidence of average incomes falling in neighborhoods facing increased pollution and rising in neighborhoods where pollution was decreasing.[21] Changes in property values were not studied.

3. The Economic Benefits and Costs of Enforcing the Clean Air Act

The Clean Air Act Amendments of 1990 required the United States Environmental Protection Agency (EPA) to periodically report to the Congress and the American people on the economic benefits and costs associated with the application and enforcement of those amendments to the Clean Air Act.[22] EPA released its most recent economic analysis in March of 2011.[23] That analysis looks only at the incremental impacts of the 1990 amendments. The benefits and costs associated with the passage

[20] "The Effect of Power Plants on Local Housing Values and Rents: Evidence from Restricted Census Microdata," Lucas W. Davis. Paper presented at the 2008 Association of Environmental and Resource Economists Summer Workshop, Berkeley, California, June 21-22, 2008. May 2010 version available at http://faculty:.haas.berkeley.edu/ldavis/pp.pdf , p. 1.
[21] "Do People Vote with Their Feet? An Empirical Test of Tiebout's Mechanism," H. Spencer Banzhaf and Randall P. Walsh, *American Economic Review*, 98(3):843-863, 2008.
[22] Section 812.
[23] *The Benefits and Costs of the Clean Air Act from 1990 to 2020, Final Report,* U.S. Environmental Protection Agency, March 2011.

of the Clean Air Act in 1970 and the 1977 amendments are not the focus on the analysis, only the additional regulations added in 1990.

The study looked at the regulation of two types of particulate (PM 10 and PM 2.5), nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), ozone, and volatile organic compounds (VOC). The direct costs of implementing the more strict standards on the emissions of these pollutants were estimated based on the cost to firms to comply with the new limits. For 2010 this was projected to total $53 billion per year. Ten years later in 2020 the compliance costs were projected to be $65 billion per year. The national impacts on total economic output and labor productivity were estimated by reflecting these higher costs of production in a national economic model.

The air quality benefits were measured by studying the damage that would have been done by the additional pollution that would have been released had the Clean Air Act not been amended in 1990. Air pollution is known to cause premature death due to heart and lung disease. It is also known to cause ongoing illness due to heat disease, non-fatal heart attacks, chronic bronchitis etc. The impacts of higher levels of pollution were measured by the higher death rates and the larger number of sick days taken by workers and students. These health impacts of high levels of pollution were expressed in monetary terms using earlier estimates by economists of the losses associated with premature death and reduced ability to work, go to school, or live an active life due to periodic illness. Health treatment costs including admissions to hospitals and emergency room were also included. These health costs that cleaner air avoided were substantial and dominated by the losses associated with premature death. In 2010 the Clean Air Act Amendments of 1990 were expected to avoid 160,000 premature deaths. By 2020 230,000 premature deaths are projected to be avoided. The monetary cost associated with those avoided premature deaths was projected by 2020 to total $1.8 *trillion* per year. The avoided costs of sickness associated with the reduced pollution were estimated to cost $77 billion per year.

There are other pollution costs that were avoided. The emissions of sulfur can lead to acid rain that damages crops, forests, and lakes. The emission of nitrogen oxides can lead to deposition of reactive nitrogen that can disturb natural systems. Particulate emissions can cause light scattering that reduces visibility, eliminating scenic vistas and some of the value of outdoor recreation. The depletion of stratospheric ozone allows ultraviolet light to damage natural vegetative systems. Finally air pollution can cause the deterioration of structures, equipment, and infrastructure, leading to higher maintenance costs or shorter lives for equipment and structures. All of these have been studied carefully over the years and economic estimates of that damage developed. These estimated annual avoided damages that would have been caused by pollution, projected to the year 2020, involved $11 billion in annual savings to agricultural and forest productivity, $8 billion in savings to ecological systems, $67 billion in savings associated with improved visibility, and $110 billion in avoided damage to materials.

When the avoided health and non-health damages are summed, the avoided damages in 2010 were estimated to be $1.3 *trillion*. In 2020 the estimated damages avoided

because of the Clean Air Act Amendments of 1990 would total $2 *trillion.* The discounted present value of the annual benefits from the Clean Air Act Amendments of 1990 from 1990 projected to 2020 totaled $12 *trillion* using a 5 percent discount rate. The direct costs of implementing the required air pollution control measures had a discounted present value of $380 billion over that 30-year period. The benefits were 32 times the size of the costs. Clearly the benefits justify the costs and the passage and enforcement of these air pollution control regulations is economically rational

Some, however, may be worried that the higher costs to businesses would slow down the growth of the economy. But when both the costs of businesses complying with the Clean Air Act and the cost savings from the benefits of reduced air pollution are taken into account, overall economic growth is largely unaffected. Initially there is a very slight slowdown in the economy (0.2 percent) which approaches zero in 2015 and turns into a very slight positive impact in 2020 (+0.02%). So on net, economic well-being is substantially improved while the rate of commercial economic growth is hardly affected at all.

III. Thinking Analytically about the Local Economy and Local Economic Well-being: The Limits of the "Export Base" View

1. Introduction

Long before a minority of us ever take an economics class or read an economics text book, we all have been learning "economics" from our parents, grandparents, elementary school teachers, and neighbors. We are informally taught "tales of livelihoods" that explain to us how our families several generations back came to inhabit areas and made livings for themselves. This *popular* or *folk economics* tends to stick with us just as other cultural values and traditions do. It simply becomes part of the way we look at the world and, in this case, think about the local economy.

One almost universal element of that popular economics is what economists have labeled an *export base* view of the local economy. In Minnesota it focuses our attention on metal mining, forest products, agriculture, and manufacturing tied to these land-based activities. This view is called an export base view because it focuses on the economic activities in which the local population specializes, producing more than it needs for its own consumption, and exports the surplus to the rest of the national or international economy. Those exports are seen as bringing money into the local economy from outside. That money then can circulate within the local economy putting people to work in locally-oriented economic activities and facilitating the import of vital goods and services that could not easily or economically be produced locally. Unless the local residents want to live a self-sufficient non-monetary, subsistence way of life, those exports and the resulting income flows into the economy from outside sources are seen as necessary for a modern, vital economy. In that sense those export-oriented

activities are the region's *economic base*: the economic energy driving the local economy.

Most regions have an export-oriented story similar to Minnesota's about the traditional economic activities that brought people to and held people in any given region: automobiles in Detroit, dairy farms in Wisconsin, corn in Iowa, wheat and cattle on the Great Plains, timber and hydroelectric power in the Pacific Northwest, coal in Appalachia, metal mining in the Rocky Mountains, etc.

No widely held popular understanding of this sort could have become established and persisted for as long as it has unless it had an important element of truth to it. In the context of the European-American settlement of a continent depopulated of its indigenous population by disease and warfare, the export base view was largely accurate in depicting how surviving Native Americans and European-American settlers were able to move from subsistence activities and homesteads on a "wilderness" frontier to a prosperous commercial economy. Whatever its historical accuracy, however, it is important to ask whether that original 19th and early 20th century economic insight is a sufficiently accurate guide for understanding a modern 21st century economy. We will assert below that the export base view of the local economy is now seriously incomplete and needs to be supplemented in several ways that allow us to accurately look at the *total* economy and all the sources of local economic well-being when developing public economic policies.

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2. Completing Our Analytical View of the Local Economy: The Total Economy

There are three important other economic insights that have to be integrated with the export base view to provide a complete and accurate view of the local economy:

i. The export base view focuses only on what creates a local demand for workers. In that sense it ignores the other half of the twin supply and demand blades of the "economic scissors," the important role of the local supply of labor in encouraging the expansion of local economic activity.

ii. The export base view focuses only on commercial goods and services sold in markets in exchange for money. It ignores non-commercial, non-market sources of scarce and valuable goods and services that support and facilitate commercial activities and contribute to local economic well-being

iii. The export base view, as the name makes clear, focuses on exports as the sole determinant of local economic vitality. Its message is that "only exports matter." We need to understand that locally-oriented economic activity is not a passive, unimportant or "secondary" aspect of the local economy. By capturing, holding, and re-circulating income that comes into the local economy, a web of locally-oriented economic activities create the "multiplier" impacts associated with exports and other income injected into the local economy.

i. Incorporating Labor Supply into Our View of the Local Economy

The export base view focuses on the commercial forces that draw workers and population to a particular area. What are the export-oriented activities the local area can support and thus create a local demand for workers? In a frontier economy these are likely to be land-based economic activities such as agriculture, mining, and timber harvest as well as the processing of these land-based products.

That narrative has a compelling historical ring to it. But most economic activities in the 21st century are not land-based. The total of all jobs in agriculture, mineral extraction, and forest products represents only about 3 percent of total jobs in the American economy in 2008.[24] Clearly we cannot explain the location of economic activity across the American landscape on the basis of this tiny part of the total economy. We also have to be able to explain why non-land-based economic activity locates where it does.

Even if we stick with a focus on export-oriented economic activities as the engine driving a local economy, we are still left with the question of why a particular export-oriented firm chose to locate where it did. If we cannot explain that, we have not really explained what the economic forces are supporting the local economy. For instance, much of light manufacturing (computer assembly, chip manufacturing, appliance manufacturing, etc.) as well as export-oriented services (publishers, information businesses, financial services, technical support, professional services, etc.) are relatively "foot-loose" in terms of where they locate. The fertility of the land, minerals in the ground, commercially valuable natural vegetation including livestock forage and forests are unlikely to provide an explanation for why most of the firms found in Minnesota or the greater Duluth area chose to locate there. For that reason, the export base view of the economy provides only limited insight into the local sources of economic vitality.

Economic activity locates in particular areas for a wide variety of reasons but two considerations are almost always important: First, the availability of a sufficiently skilled workforce at an affordable cost and, second, access to the markets for the firm's products at an affordable cost. The geographic distribution of the population and people's preferences for where they would like to live influence both of these. Businesses cannot afford to ignore either of these: markets and the cost of reaching them and adequate labor supply at a reasonable cost are central to any business.

The export base view of the world implicitly assumes that people do not care where they live. People are assumed to passively go to where the jobs are because they have no choice if they want to be employed and their families to prosper. But in the 21st century continental-wide American economy, individuals and families *do* have a choice as to where they chose to live. They face a broad range of economic opportunities mixed with an equally broad range of regions and communities that, in turn, have a broad range of

[24] Agriculture, agricultural services, fishing, forestry, mining (including oil and gas), wood products, paper, and primary metals. U.S. Department of Commerce, BEA, REIS data base. http://www.bea.gov/regional/spi/default.cfm?selTable=SA25N&selSeries=NAICS

attractive and unattractive characteristics that are unrelated to job availability and pay. Individuals and families can make choices and tradeoffs that mix labor market opportunities and pay with other local characteristics such as commitment to place, quality of schools, crime rates, levels of congestion, intensity of social conflict, pace of life, familiarity, cultural variety, recreation and cultural opportunities, etc.

Areas that have mixes of qualities that make it easy for those areas to attract and hold residents will have a relatively large, diverse, and skilled workforce available at a somewhat lower price. Alternatively, such areas can get workers to move to the area without wages being bid up significantly. That makes such areas attractive to businesses. The fact that businesses are run by people who also have preferences about where they and their families live, only adds to the economic importance of a community's attractive qualities. To the extent the dynamic between the attractiveness of a community to new residents and businesses has triggered ongoing economic development, local markets for goods and services will also be expanding, increasing the economic attractiveness of the area to firms.

In brief, labor supply and its cost and the location of population concentrations matter to businesses. Areas that attract high quality workers at a relatively low price will, in turn, be attractive to business firms. Ignoring labor supply and focusing only on labor demand, as the export base view does, is inappropriate economic analysis. As in most components of a market economy, both supply and demand matter.

It is important to keep in mind that conceptually, we do not have to choose between the export base view of the economy and the residential location choice view. These two views encompass between the two of them the two primary market forces of supply and demand. We should be careful to consider both. The relative importance of labor supply and labor demand can be expected to shift over time and vary across geographic areas. At any particular location at a given time, the relative importance of these two sets of forces is an empirical matter. Local economic development policy, however, may choose to focus strategically on some elements of one or both of these sets of economic forces.

ii. Looking at All Sources of Economic Value Including Non-Market Economic Values

Place matters to people. This is obvious when it comes to the Fond du Lac Reservation and other Native American homelands where the cultural, social, and historical connections with a particular place are central to most Band members' residential location decisions. But the same is true to a lesser degree to most residents or potential residents.

The economic dynamic described above has been called *amenity-supported local economic development*. This economic potential in some ways is the opposite of the economic force that the export base view of the economy emphasizes. Within the export base view, people move to where the jobs are. Within the amenity-supported economic development model, economic activity follows the residential preferences of the

population. Economic activity shifts in this way because the existence of local amenities provides businesses with access to a lower cost skilled labor force and to markets for their goods and services. In essence, because workers and families value local amenities, they are willing to sacrifice a certain amount of income to gain access to those site-specific qualities. They accept lower wages than they could earn in less attractive locations as an effective "price of admission" to what potential residents judge to be a more valuable set of local qualities. The *total real income* being received by residents comes in two parts: The value of the conventional paycheck and the value of the site specific amenities to which living in that location provides access. The value of those local amenities provides residents with a "second paycheck." [25]

This is not a new way of looking at the local economy. Since the mid-1950s economists have emphasized the importance of residential location decisions as a powerful economic force. They focused on the role of local environmental "amenities" such as climate and natural landscapes in the settlement of the desert Southwest (including Arizona, New Mexico, and Southern California), Florida, and the Pacific Northwest.[26] At about the same time other economists underlined the fact that people "shop around" for the social amenities produced by different levels of local government taxation and different public spending patterns such as on schools, parks, and roads.[27] Given the role of active choice over residential location, economists concluded that in a mobile, open economy, it would be an area's ability to attract and hold a labor force without bidding up labor costs that would determine the geographic distribution of economic activity.[28]

A half-century of economic research has underlined the important role that non-commercial, non-market goods and services can play in contributing both to the economic well-being of individuals and households as well as to the economic vitality of communities. Some of these non-market economic values are human-created, others are gifts of nature, flowing as they do from well-functioning natural systems. All of them are often encompassed in the larger concept of "quality of life" or "local amenities."

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[25] Ed Whitelaw at the University of Oregon and with ECONorthwest coined that phrase. Local economies can be a bit more complicated than this. As the local economy expands, limited supplies of land for commercial and residential development can result in land value increases and both the cost of living and the cost of doing business rising. This can ultimately work to stabilize community size limiting that location to those for whom it is the most productive site for a business and to those residents who most highly value the qualities of that location. The higher cost of living will reduce the purchasing power of local wages and residents will pay an effective access fee in the form of lower real (cost of living adjusted) wages. To the extent that the available land base is not a serious constrain on ongoing development, the effective price residents pay to gain access to the qualities associated with that location are likely to be reflected in the lower pay they accept compared to what they could earn in less attractive locations.

[26] Ullman, Edward, 1954, "Amenities As a Factor in Regional Growth, ***Geographic Review***, 44(1):119-132.

[27] Tiebout, Charles, 1956, "A Pure Theory of Local Expenditures, ***Journal of Political Economy***, 64(2):160-164.

[28] Borts, G.H., and J.L. Stein, 1964, ***Economic Growth in a Free Market***, New York: Columbia University Press

The social environment is the source of some of the most important of these non-market economic values including among other things:

- a legal system and the rule of law that establishes the context for productive private economic activity,
- protected air and water quality, watersheds and water supplies,
- public health and safety protection including waste treatment,
- education from preschool through graduate school,
- public transportation networks including our road and highway systems
- providing security from crime against persons and property,
- land use regulation to protect neighborhood livability and reduce congestion,
- provide parks, open space, and public outdoor recreation opportunities,
- protect wildlife and wildlife habitat as well as traditional subsistence goods,
- provide a safety net for families in crisis.

Most citizens recognize that all of these are valuable to them and their families, enhancing their personal well-being, as well as valuable to the overall economy, boosting its productivity and vitality.

But non-market goods and services do not just flow from government units and non-profit organizations, they also flow from the natural environment and, because of the role of governments and non-profit organizations in protecting the natural environment, there is some overlap in the listing of those valuable, non-market but economic, goods and services. These non-market economic values flowing from natural systems and landscapes have come to be called environmental or ecosystem services. They are the basis for much of the contemporary concern about degrading environmental values. The better known of those environmental services at risk include:

- clean air and water,
- natural landscapes accessible for dispersed outdoor recreation and subsistence activities,
- wildlife, hunting, and fishing,
- scenic beauty,
- climate stabilization,
- storing and stabilizing water flows,
- cultural and spiritual support,
- complex biological and chemical process that support the web of life on which we all rely.

Again, most people would agree that all of these contribute relatively directly to their well-being and to the attractiveness of their communities as places to live, work, and do business. Although these goods and services flowing from natural systems are often described in terms of their contribution to the “quality of life,” that does not make them “non-economic.” As the discussion above documented, local “quality of life” matters to people, the pursuit of it changes the location of economic activity, and protecting or enhancing local quality of life is often a central focus of local economic development

strategies. The goods and services flowing from natural systems contribute directly to human well-being and become scarcer as natural systems and landscapes are degraded. For that reason, even though they are not provided by commercial businesses or directly traded in commercial markets, they have an important economic aspect to them.

Over the last several decades economists have carried out hundreds of economic valuations of various non-market goods and services. One major focus has been on outdoor recreation, especially on federal lands. A recent summary of the results of those studies was published by the U.S. Forest Service. Table 2 is taken from the compilation of the results of this literature survey. These results are presented for illustrative purposes, to simply indicate that the non-market values we are talking about can be substantial. It should be emphasized that although it is often convenient to quantify non-market economic values in dollar terms that is not the only way that benefits and all costs can be accounted for before making a public resource decision. Putting dollar values on non-market goods and services is convenient because then those non-market values can be directly compared to the market value, for instance, associated with the production of paper products, iron ore, of building materials. Such quantification, however, can be costly in terms of both time and money since it often requires very site specific survey information. In addition, although most people recognize environmental damage as a real cost that decreases well-being and may negatively impact local economic vitality, many of those same people find expressing that environmental damage in dollar terms at best unconvincing and confusing and at worst inappropriate or ethically wrong.

A thorough analysis of all benefits and all costs, that is, a review of the total economic impact or the net economic impact, can be carried out without putting all the values at issue in dollar terms. Environmental risks of significant economic concern can be evaluated in physical terms that quantify the degree of damage, the geographic extent of the damage, and the level of public concern about that damage.

Of course, just as National Parks and Wilderness Areas impose more restrictions than just Class I air quality regulations, they also protect a broader range of environmental values than just air quality. It is the mix of both the environmental restrictions and the value of the environmental amenities protected that determine the net impact on local economic vitality and well-being. In the following discussions we will focus more directly on the economic impacts of regulating air emissions to protect local air quality.

Because the economy of northeastern Minnesota where Voyageurs National Park and the Boundary Waters Canoe Wilderness Area are located has been tied to the cyclical forest products and metal mining industries, it is difficult to say anything definitive about the impact that each of these protected areas had on the local economy since they were granted protection (1964 for Boundary Waters and 1975 for Voyageurs). Nationwide employment in forest products and metal mining has plunged as labor-displacing technological change has reduced the need for workers and international competition has displaced significant parts of the United States steel and forest products industry.

What can be said is that despite the Class I air quality status of both of these areas stretching across the entire border of northeastern Minnesota with Canada, the iron industry is rebounding from the previous and current recessions as world steel production has boomed. Copper, nickel, and precious metal mining may also be developed in Minnesota for the first time.

Table 2

Average Economic Value Per Person Per Day--Consumer Surplus
Recreation Benefits Studies, 1967-2003

Type of Outdoor Recreation Activity	Number of Studies	Number of Estimates	Average Value (2004 $s)	Range of Estimates (2004 $s)	(2004 $s)
Backpacking	1	6	$52.10	$26.82	$80.34
Birdwatching	4	8	$29.60	$5.80	$78.46
Camping	29	48	$37.19	$2.03	$224.53
Fishing	129	177	$47.16	$2.08	$556.82
Floatboating/Rafting/Canoeing	20	81	$100.91	$2.70	$394.82
General Recreation	15	39	$35.10	$1.42	$257.51
Hiking	21	68	$30.84	$0.40	$262.04
Horseback Rding	1	1	$18.12	$18.12	$18.12
Hunting	192	277	$46.92	$2.60	$250.90
Mountain Biking	7	32	$73.78	$20.86	$295.69
Off-Road Vehicle Driving	4	10	$22.92	$5.24	$40.86
Picnicking	8	13	$41.46	$8.94	$142.74
Pleasure Driving	4	11	$59.23	$3.02	$167.74
Rock Climbing	4	27	$56.26	$26.62	$135.82
Sightseeing	15	28	$36.84	$0.65	$209.77
Swimming	11	26	$42.68	$2.20	$134.34
Wildlife Viewing	69	240	$42.36	$2.40	$347.88
Other Recreation	15	16	$48.70	$5.71	$206.82

Source: "Updated Outdoor Recreation Use Values on National Forests and Other Public Lands," John Loomis, Table 1
U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, PNW-GTR-658, 2005.

iii. Capturing, Holding, and Circulating Income in the Local Economy

We return to a discussion of how the modeling of the local economic impacts has to move beyond an “only exports matter” point of view. Most economic impact modeling, implicitly takes that point of view, effectively dismissing the bulk of local economic activity as “secondary” or “passive.” It is important to recognize this as an economic error. Below we will discuss in some detail the failure of a conventional export base modeling approach to explain the actual economic vitality of the Carlton County economy. Here we focus on the important economic role of locally-oriented economic activity in boosting the local economy.

Exports by themselves do not create a local economy. On the North Slope of Alaska billions of dollars’ worth of oil have been produced but there is almost no “local economy” on the North Slope. The value of that oil and the wages earned producing it all flow to other areas a great distance from the North Slope where people actually live

and where there is the commercial infrastructure in which that income can be spent. This is an extreme example, but the mining, timber and farm towns that grew up around a primary export often had similar limiting characteristics: the income generated by the exports primarily went to fund imports. That is, the income from the exports almost immediately "leaked out" of the region. That is why many of these towns became the equivalent of ghost towns as demand for the exports declined or technological change reduced the size of the workforce needed to produce the exports. Empirical economic analysis of the impact of natural resource activities in rural areas confirms that the multiplier impacts associated with natural resource extraction activities in contemporary rural areas can also be nearly zero.[29] In other words, all of the money that is created from the natural resource activities leaves the rural areas where those activities actually took place.

The actual size of the impact of an export activity on the local economy is determined by the interaction of two sets of local economic characteristics: The size of the flow of income into the local economy from the outside and the web of local economic interconnections among residents that captures and circulates that income among businesses and households. The "multiplier" impacts associated with export income is determined by that ability to capture and circulate income locally. It is the local web of specialized and interdependent businesses and households that actually make up the local economy. Without those locally-oriented businesses there can be enormous export flows but only a primitive local economy.

Both export-oriented and locally-oriented businesses contribute to the vitality of the local economy. It can be a serious economic error to ignore either of these two sides of the local economy.

3. The Fond du Lac Reservation Economic Study Area

The study area for our analysis of the economic impacts of Class I Designation for the Fond du Lac Reservation will be Carlton County where over half of the Reservation is located and where almost three-quarters of the Reservation residents live. We, however, will also take into account the economic linkages between the Reservation and St. Louis County where almost half of the Reservation is located as well as the Duluth metropolitan area centered on the twin cities of Duluth, MN, and Superior, WI.

We have chosen to focus on Carlton County for several reasons. The Fond du Lac Reservation lies in two northeastern Minnesota counties: Carlton and St. Louis. About 54 percent of the Reservation lies in Carlton County and 46 percent in St. Louis County. St. Louis County, however, is one of Minnesota's largest counties both in terms of population and geographic area. The city of Duluth in St. Louis County is part of the urban core of the Duluth metropolitan area that includes Duluth's twin city of Superior,

[29] "A Test of the Economic Base Hypothesis in the Small Forest Communities of Southeast Alaska," Guy C. Robertson, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report, PNW-GTR-592, December 2003. http://www.fs.fed.us/pnw/pubs/pnw_gtr592.pdf

Wisconsin, as well as the three-county area of St. Louis and Carlton Counties in Minnesota and Douglas County in Wisconsin. In 2010 the Duluth metropolitan area had a population of 279,000, making it the second largest urban area in Minnesota after the Minneapolis area. St. Louis County by itself had a population of 200,000 according to the 2010 Census. The total population of the Fond du Lac Reservation according to the 2010 Census was only 4,250. Of these Reservation residents, only about 1,000 lived in St. Louis County.

St. Louis County stretches almost 140 miles from the western tip of Lake Superior to Voyageurs National Park and the Canadian border. St. Louis County with an area of almost 6,900 square miles is the largest county in Minnesota. The area of the Fond du Lac Reservation is 153 square miles, 71 square miles of which are in St. Louis County. That is, only one percent of St. Louis County lies on the Reservation and the residents of that part of the Reservation represented less than one-half of one percent of the St. Louis County population.

Because of the size of St. Louis County relative to the Fond du Lac Reservation, we have chosen Carlton County as the study area for discussing the local economic impacts of Class I air quality designation for the Fond du Lac Reservation. Although the Reservation is more or less evenly divided between Carlton and St. Louis Counties in terms of land area, almost three-quarters of Reservation residents live in Carlton County. The Carlton County portion of the Reservation also makes up about a sixth of Carlton County's area and an eighth of its population. As mentioned above, the St. Louis portion of the Reservation is swamped by that much larger county. In addition, the economy of St. Louis County is dramatically different than that of the Reservation and Carlton County. The relatively large urban economy centered on Duluth dominates the economic statistics for St. Louis County. Also, central St. Louis County contains Minnesota's "Iron Range" which historically has been dominated by the production of iron ore concentrates and, more recently, proposals for steel and copper production. This, too, is not a characteristic of the Reservation or Carlton County.[30]

This does not mean that we will ignore St. Louis County or the Duluth-Superior urban area. As mentioned above, Carlton County is part of the Duluth metropolitan area. It is included in that urban dominated area because of the commuting patterns of residents of Carlton County. The city of Duluth only two dozen miles from the Reservation's eastern boundary as well as Carlton County's largest city, Cloquet. A significant part of Cloquet is on the Reservation. Given this proximity of the Fond du Lac Reservation and Carlton County to Duluth, it is not surprising that significant numbers of Carlton County residents commute to work and shop in the Duluth-Superior urban area.

The Fond du Lac Band also takes advantage of the proximity of that metropolitan area to draw customers to its Black Bear Resort and Casino at the southeastern corner of the Reservation as well as to its Fond-du-Luth Casino in Duluth itself. These economic

[30] There is significant "mining" in Carlton County, but it involves the removal of sand, gravel, and aggregate for building materials.

connections between the Reservation and Carlton County and the Duluth-Superior urban area will be taken into account in our economic analysis.

4. The Limits of the Export-Base View of the Local Economy in Which the Fond du Lac Reservation Is Embedded

As pointed out above in the discussion of how to analyze a contemporary local economy, often the economic forces supporting local economic vitality are over-simplified into what has come to be called an "export base" or "economic base" view of the economy. In northeast Minnesota this usually involves focusing on the land-based economic activities of mining, forest products, and agriculture and associated manufacturing as the historic export base. Within that export base view, local economic health is claimed to be determined by the health and profitability of those export-oriented businesses that the local community hosts. That approach to the local economy artificially narrows our view of the actual sources of local economic vitality and encourages us to limit ourselves to the view through the rear-view mirror rather than directing our attention to present reality and future trends.

Discussions of the greater Duluth economy as well as relatively rural areas such as the Fond du Lac Reservation and much of Carlton County often are carried out in the context of the export base view. In that view, businesses are assumed to locate in a community because of certain site-specific economic resources such as forests that provide the raw materials for pulp, paper, and wood products manufacturing as well as agriculture. Just to the north of the Reservation in St. Louis County iron ore mining and processing and potentially copper and steel production tend to be seen as the economic base. These export-oriented business firms create jobs, and workers and their families move to where those jobs have to be located. The distribution of these export-oriented natural resource firms is claimed to explain why people live where they do. To many this is just hard-nosed economic realism. "That's the way the economy is."

One serious limitation of this over-simplified view of what makes the local economy tick is that it does not explain very well the changes that have taken place in the Carlton and greater Duluth economies over the last several decades. If we separate the traditional export-oriented sectors from the rest of the economy and look at how employment and income have changed, it is clear that there are other forces driving the local economic vitality of the area surrounding the Fond du Lac Reservation.

If we approximate the "traditional" export sectors of Carlton County as agriculture, forestry, mining, manufacturing, and federal military employment and look back over the last four decades, we see employment in those export sectors declining by 45 percent at the same time that employment in the rest of the economy was expanding, almost tripling.[31] Between 1969 and 2009 jobs in the export sectors declined by almost 2,000

[31] I have labeled this the "traditional export sectors" because they are the sectors that are usually mentioned when an area's "economic base" is discussed. Most economic observers today would go

jobs while over 10,000 jobs were added in the rest of the economy.[32] That is, each lost export sector job was replaced by about five other jobs outside of the traditional export sectors. This is the opposite of what the export base view indicates should have happened. As the traditional export base lost jobs, it should have pulled employment that was non-export or locally-oriented down with it, with negative "ripple" or multiplier impacts.

The export base view of the economy is an income circulation model and is most accurately applied to changes in the income flowing in from outside the economy because of exports. We can look at the relationship between the traditional export base and the non-export flows of income by focusing instead on aggregate real income received by residents of Carlton County from employment in the export sectors and compare it to income received by residents who do not work in the traditional export sectors. The real earnings paid to workers in the Carlton County traditional export base sectors decreased by about $81 million, a 41 percent decline. Instead of income received from other sources in Carlton County following the export base downward, real income from other sources expanded by $677 million. For each dollar decline in payrolls in the traditional export base, over $8 was obtained from other sources. Again, rather than the traditional economic base driving the rest of the economy, the rest of the economy was showing significant autonomous economic vitality that allowed the economy to continue to expand despite the significant declines in the traditional economic base. The Figures 2 and 3 below show this for both jobs and income.

It is important to realize that this divergence between a declining traditional economic base and an expanding overall economy is not a unique feature of Carlton County. The same pattern is found in the larger counties more or less adjacent to the Fond du Lac Reservation: St. Louis County to the north and east and Douglas County, Wisconsin, to the east. Those two counties are home to Duluth and Superior respectively. In St. Louis County real earnings from the traditional economic base **declined** almost 60 percent between 1979 and 2009 while real income from outside of the traditional economic base **expanded** 120 percent. In Douglas County between 1979 and 2009 real earnings in the traditional economic base declined by about a quarter while real income received outside of the traditional economic base expanded by 70 percent.

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beyond these "traditional" sectors to include economic activity associated with visitors ("tourists"), educational institutions serving primarily non-residents, and specialized services being provided to clients outside of the local economy. As a result my residual "rest of the economy" includes some economic activity aimed at customers outside the local economy. This will be discussed later in the report.

[32] All economic statistics, unless otherwise indicated, come from the U.S. Department of Commerce's Regional Economic Information System. Income figures are converted to 2009 dollars using the CPI. The 1969 starting point is the first year for which this local economic data is available for all counties.

Figure 2

Jobs in the Traditional Economic Base and the Rest of the Economy: Carlton County, MN

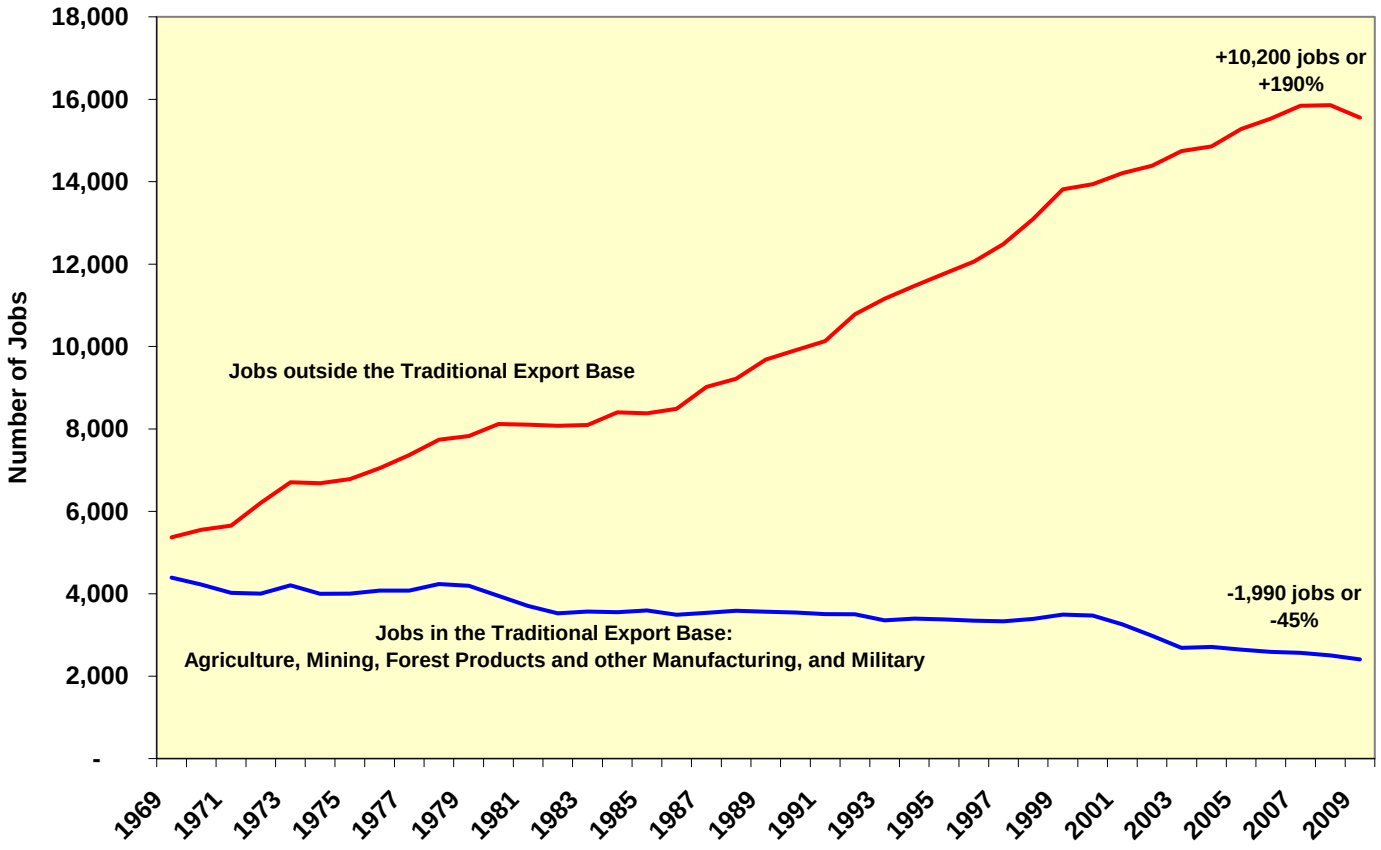
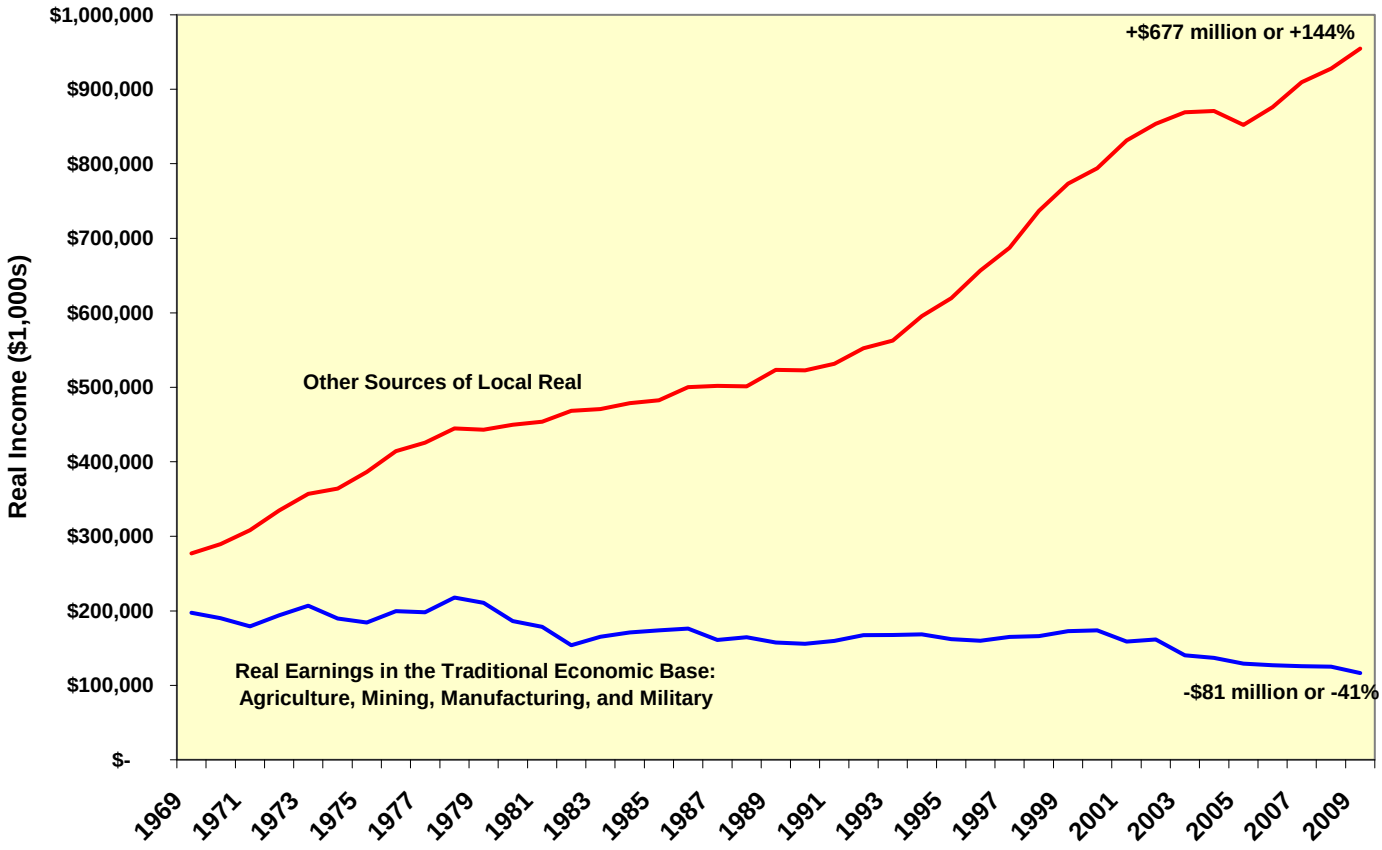


Figure 3

Income from Traditional Economic Base and the Rest of the Economy: Carlton County, MN



5. The New Sources of Economic Vitality in the Area Surrounding the Fond du Lac Reservation

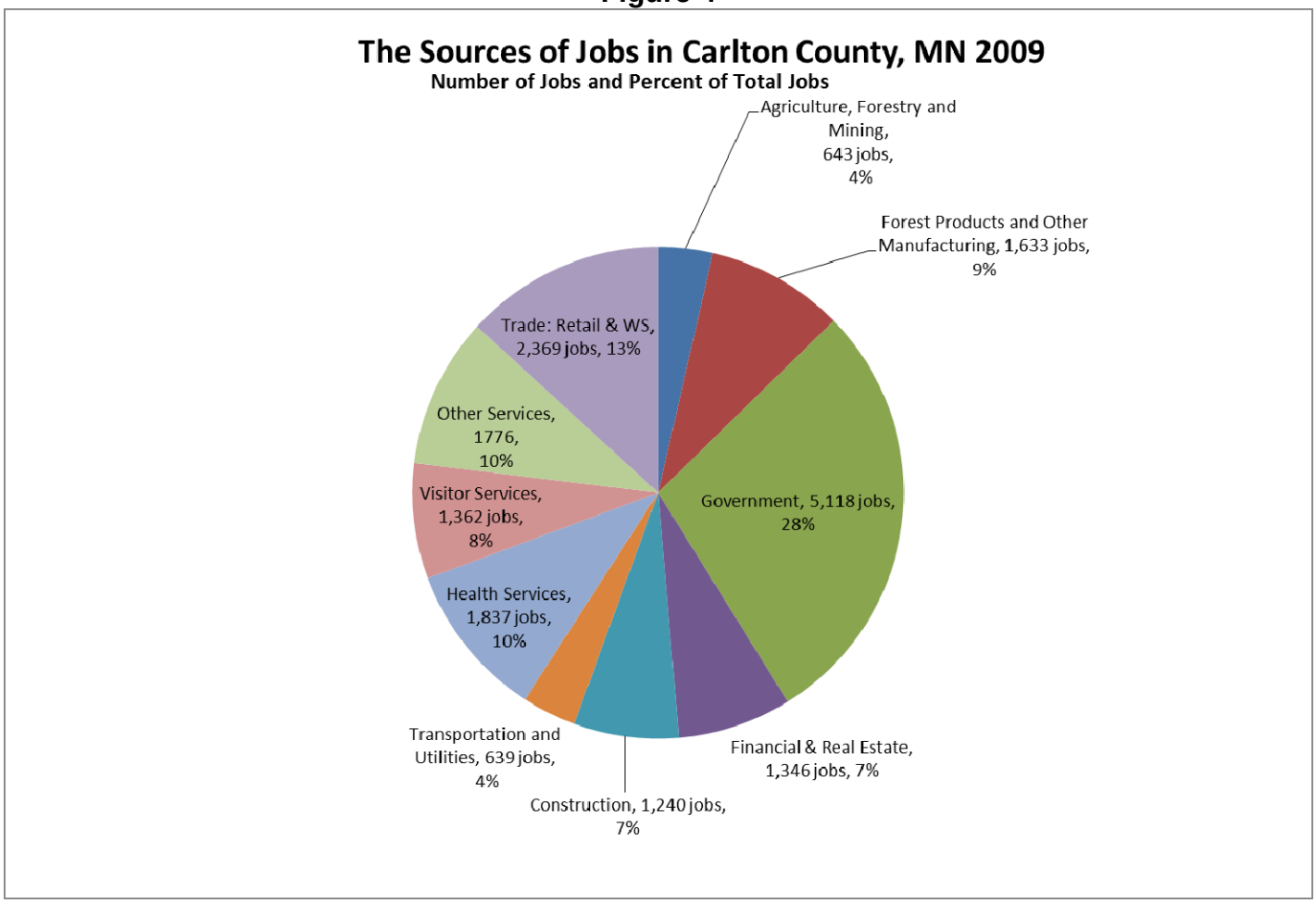
The ongoing expansion of the Carlton County economy despite declines in employment and real earnings in the traditional export base may appear to be an economic puzzle to some. For that reason it is important to understand what sectors of the economy have been responsible for the dramatic economic vitality of the Fond du Lac Reservation area despite the difficulties in forest products, other manufacturing, and agriculture over the last several decades.

A. 2009 Snapshot of the Carlton County Economy

i. The Sources of Jobs

The sectors that are the source of most of the jobs are government including the governmental activities of the Fond du Lac Reservation (28 percent), the service sectors, including health and visitor services (28 percent), and retail and wholesale trade (13 percent). Those three broad sectors represent over two-thirds of all jobs in Carlton County. The traditional land-based economic activities, agriculture, forestry, forest products and other manufacturing and mining were the source of 13 percent of jobs. Construction provided 7 percent of the jobs as did financial and real estate firms. Finally transportation and public utilities were the source of the remaining 4 percent of jobs. See Figure 4 below.

Figure 4



It should be pointed out that the almost 1,400 “Visitor Services” jobs shown in figure 3 above represents only part of the visitor economy, namely employment in accommodations, eating and drinking establishments, entertainment, and recreation.

The retail sales, transportation, and other sectors impacted by visitors are not included in that total but reported in the establishments that serve both local residents and visitors. In that sense our "visitor services" job number both over- and under-counts employment in the visitor economy. It over counts because it assumes that all expenditures in eating, drinking, and entertainment establishments comes from visitors and that none of it involves resident expenditures. It undercounts because visitors are assumed to spend no money in retail trade establishments and other service sectors.

The Explore Minnesota Tourism office of the State of Minnesota provides estimates for 2008 of visitor expenditures and their economic impacts.[33] Explore Minnesota estimated that traveler expenditures in Carlton County totaled almost $72 million and directly provided 1,100 full-time equivalent jobs, counting all impacts of visitor expenditures. Since many of the travel industry jobs are seasonal and/or part-time, the actual number of jobs created was considerably higher than this. The job information that was the basis for the pie chart above does not distinguish between full- and part-time employment. All jobs, no matter how many hours a week are associated with them, are added together and reported as "total jobs." That information accurately counts jobs but over-states the number of full-time equivalent jobs. The two sets of data on the visitor economy suggest that about 1,770 full- and part-time jobs are directly created with a payroll of about $19 million.[34]

ii. The Sources of Workers' Earnings

If we measure the relative importance of the various sectors of the economy in terms of the contribution they make to the total payroll paid to workers in Carlton County, the picture is somewhat different because some sectors of the economy provide more full-time jobs and the annual pay per job varies from industry to industry. For instance, paper, wood products, and other manufacturing in Carlton County represent only 11 percent of all jobs but are the source of 17 percent of all labor income because those jobs' pay is above average and more of them are full-time jobs. At the other extreme is agricultural employment and earnings. The income received by self-employed farmers fluctuates with agricultural commodity prices. 2001 through 2009 were not good years for farmers. Between 2000 and 2002 farm proprietors' income was actually negative. In 2009 it was only $406,000 spread over almost about 400 farm proprietors in Carlton County. That is, annual net earnings were approximately $1,000 per farm per year! As a result, despite providing 2.4 percent of all jobs, those jobs were the source of less than one-tenth of one percent of earnings. Government jobs also pay somewhat above average wages and also are more likely to be full-time jobs. As a result, although government is the source of 28 percent of jobs, it is the source of 38 percent of earnings. On the other hand, visitor economy jobs have both lower pay and many are

[33] "The Economic Impacts of Expenditures by Travelers on Minnesota: June 2007-May 2008 County Report." David-Peterson Associates, prepared for Explore Minnesota Tourism and the University of Minnesota Tourism Center.

[34] The pay per job implied by the Explore Minnesota Tourism estimates was approximately 50 percent higher than the pay per job associated with the Regional Economic Information System data, suggesting that there are approximately 1.5 visitor economy jobs for each full-time equivalent job.

part-time. As a result, although almost 8 percent of jobs in Carlton County were associated with the visitor economy, only about 2.5 percent of earnings come from those jobs. See Table 3 below.

Table 3

The Relative Importance of Economic Sectors As a Source of Earnings and Jobs: Carlton County, 2009

Sectors of the Economy	Relative Importance	
	Earnings	Jobs
Government	38.2%	28.5%
Trade: Retail & Wholesale	9.2%	13.2%
Health Services	10.2%	10.2%
Prof., Tech, Repair, & Other Services	6.7%	9.9%
Forest Products and other Manufacturing	17.0%	9.1%
Visitor Services	2.4%	7.6%
Finance & Real Estate	4.1%	7.5%
Construction	8.0%	6.9%
Agriculture, Forestry & Mining	0.2%	3.6%
Transportation and Utilities	4.0%	3.6%

Source: US Dept Comm, BEA, REIS

iii. Non-Employment Income: Investment, Retirement, and Other Income

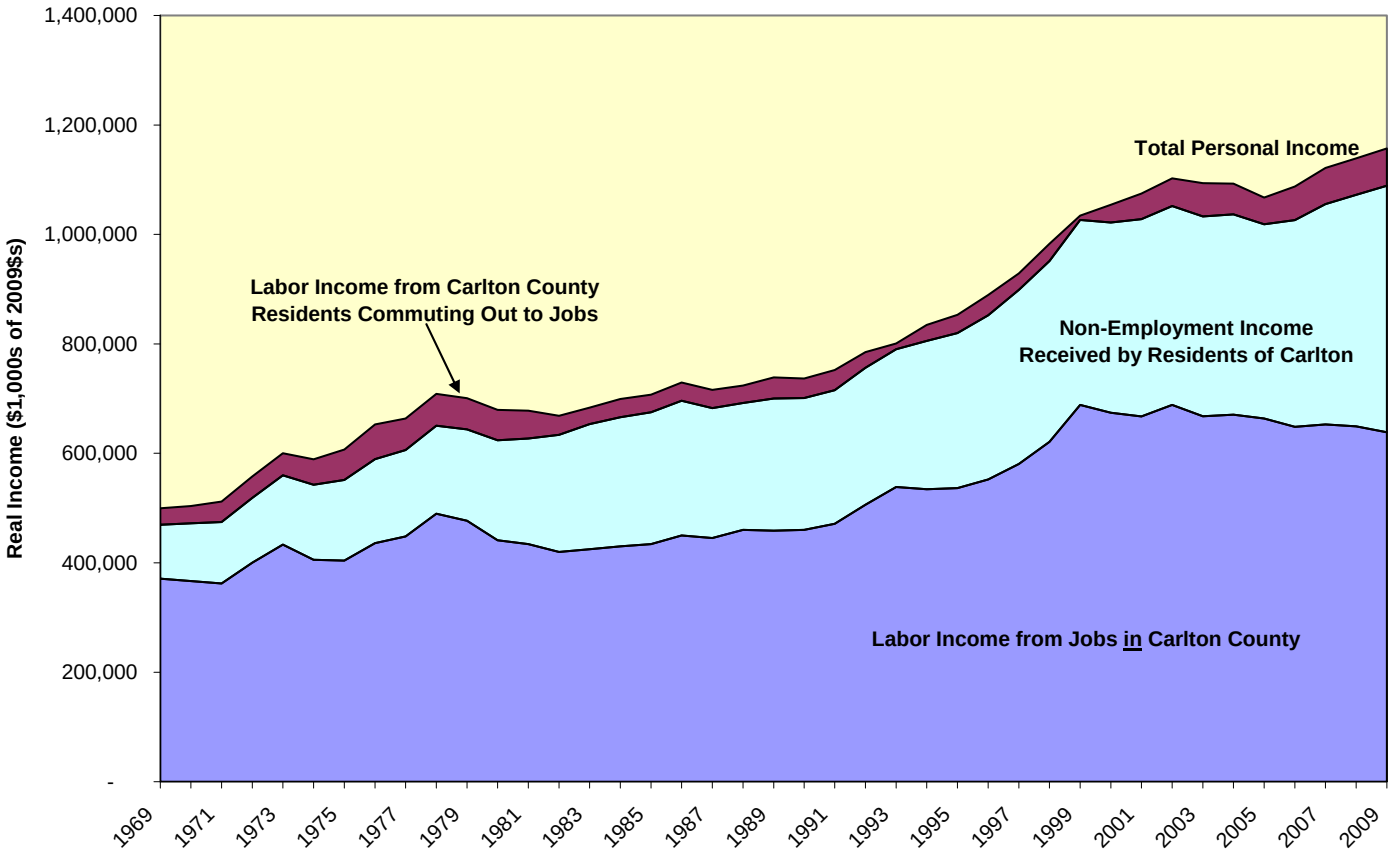
Labor earnings (wages and salaries and the net income of the self-employed) are not the only source of income to individuals and households. Income is also received from investments in stocks, bonds, and real estate in the form of dividends, interest, and rent. Some of this investment income is also retirement income. In addition, people receive income from government-run programs such as Social Security, Medicare, Medicaid, Food Stamps, Unemployment Compensation, other government support programs, and military pensions. These collectively are labeled *transfer payments* in the national economic accounts because they involve the government collecting revenues from one group of people and transferring it to another group of people in a form that is not *current* wages or salaries although workers may have paid into these programs during their working lives.

Investment income and transfer payments represent substantial flows of income. Total labor earnings associated with jobs in Carlton County in 2009 were $640 million. Investment income was $162 million and transfer payments were about $289 million. That is, investment income added about 25 percent to the labor earnings and transfer payments added another 45 percent. As a result, total personal income was $1.1 billion, 68 percent larger than the labor earnings associated with Carlton County jobs alone. Put slightly differently, labor earnings associated with jobs in Carlton County were the source of only 60 percent of total personal income. The other 40 percent of personal income was received from sources not related to current employment in the Carlton County economy. For that reason, investment income and transfer payments are often called *non-employment income.* Figure 5 below shows the way labor earnings, transfer

payments, and investment income contributed to total personal income in Carlton County in 2009.

Figure 5.

Sources of Real Personal Income in Carlton County, MN



In addition to its relatively large size, non-employment income has another characteristic that makes it economically important: This type of income is "footloose" in the sense that it follows people to wherever they choose to reside. For that reason it makes people more mobile because they have a source of income that is not tied to employment opportunities at any particular location.

iv. Income from Commuting Out to Work

There is one other source of income to households and individuals: labor earnings associated with jobs that are not located in Carlton County. Carlton County is somewhat of a bedroom community to the urban economies of Duluth and Superior. Some individuals choose to live in Carlton County but commute out to work. This leads to income flows into Carlton County. Similarly, some residents of surrounding counties commute into Carlton County but return to their counties of residence at the end of the

work day. This leads earnings that are generated within Carlton County to leak out to the counties where the workers reside. In 2009 the net impact of the out-commuting and in-commuting to work was a net flow of labor earnings *into* Carlton County of $68 million. This was equivalent in size to the earnings provided by all or manufacturing or health services or retail and wholesale trade in Carlton County. It was the equivalent of 11 percent of the labor earnings received by residents of Carlton County. Figure 5 shows the fluctuations and trends over the last four decades in this flow of net income into Carlton County associated with people choosing` on net` to live in Carlton County but work elsewhere.

B. The Sources of Local Economic Vitality: Job and Income Gains and Losses

Earlier we pointed out that while the traditional export sectors have shown relatively little growth as sources of new jobs and wages and salaries, the rest of the Fond du Lac Reservation area economy showed considerable economic vitality. Here we wish to briefly explore the sectors that did and did not contribute to that vitality. Table 4 shows the expanding sectors as well as the contracting sectors of the Carlton County economy over the last four decades. The changes in real payroll between 1970 and 1999 as well as between 1999 and 2009 are shown as are the changes for the whole forty-year period.

Table 4

The Sources of Economic Vitality: Growth in Real Earnings by Sector: Carlton County, MN ($Millions)

Sector of the Economy	1970-1999	1999-2009	1970-2009
Government	$104.0	$67.0	$171.0
Finance & Real Estate	$12.2	$7.5	$19.8
Health Services	$22.0	$28.5	$50.5
Visitor Services	$10.7	-$1.7	$9.0
Prof., Tech, Repair, & Other Services	$33.1	-$0.7	$32.4
Utilities and Transportation	$8.9	-$3.2	$5.7
Construction	$120.1	-$78.6	$41.5
Trade: Retail & Wholesale	$25.6	-$5.1	$20.5
Manufacturing	-$13.7	-$56.9	-$70.5
Agriculture & Mining	-$4.0	-$3.4	-$7.4
Total Real Earnings	$318.9	-$46.5	$272.4
Source: US Dept. Comm. BEA REIS			

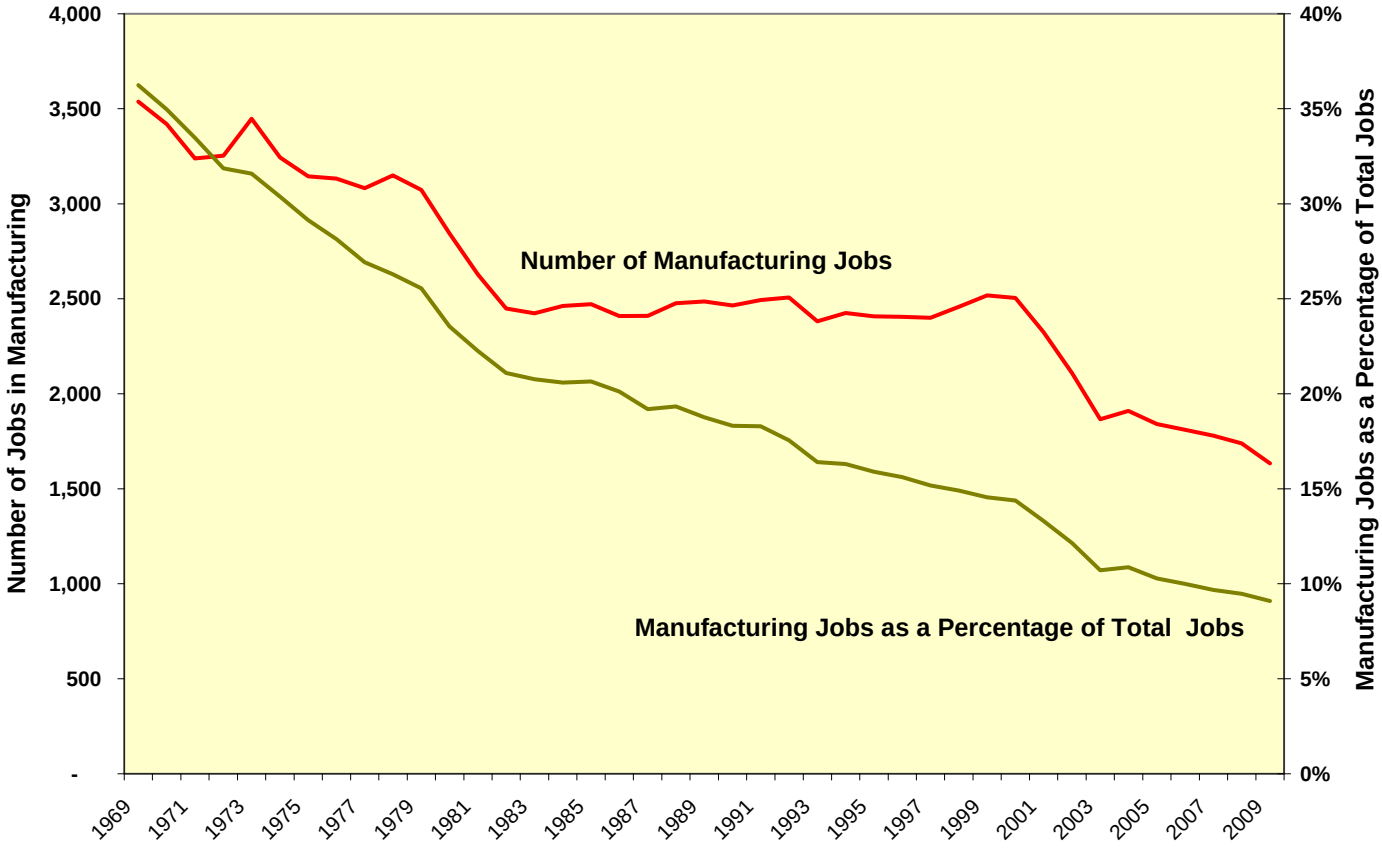
i. Forest Products, Including Paper, and Other Manufacturing

Manufacturing, which includes the paper mill, logging, and wood products, saw significant decreases in payrolls across both time periods. The losses accelerated: almost $14 million between 1970 and 1999 and the almost $57 million between 1999 and 2009 for a total loss of almost $71 million in local payroll. Total manufacturing payroll peaked in 1978 at $204 million. By 2009 that payroll had almost been cut in half, falling to $109 million. (All dollar values corrected for inflation and expressed in 2009

dollars of constant purchasing power.) Jobs in manufacturing also declined from over 3,500 in 1969 to 2,500 in 1999 and then declined further to about 1,600 in 2009. Over half of the manufacturing jobs were lost over this forty-year period. Manufacturing went from providing about 36 percent of all jobs to providing just 9 percent of jobs. That is, the relative importance of manufacturing as a source of jobs fell to a quarter of what it once had been. Real payrolls fell to a third of what they had been. See the figure 6.

Figure 6

Trends in Paper, Wood Products, Logging, and Other Manufacturing Jobs in Carlton County



It is not just in Carlton County that paper mill employment was declining. Across Minnesota, paper employment declined by about a third between 2000 and 2009, displacing about 5,000 Minnesota workers. Manufacturing employment in Carlton County fell between 2000 and 2009 by a somewhat larger percentage, 35 percent. But the employment at the Cloquet paper mill was estimated to be between 600 and 800 during the 2000s. Total manufacturing jobs, however, fell from 2,500 in 2000 to 1,600 in 2009, a loss of 900 jobs. Since paper industry employment in Cloquet did not disappear completely, there were also significant job losses elsewhere in Carlton County manufacturing, including in the wood products firms.

Farm employment also tumbled. In 1980 about 900 people worked in agriculture. By 1999 this had fallen to 650 and by 2009 it had fallen to 440. As mentioned above real earnings in agriculture fluctuate widely with the farm commodity prices. During peak years in the 1970s and 1980s real farm income rose to $10 to $14 million per year but then would tumble to $3 to $4 million a year or two later. During the 2000s farm income actually became negative because of so many farm operations actually losing money. Between 2000 and 2009 farm income never climbed above $2 million per year and for seven of those years was closer to just $500,000.

Clearly the traditional land based economic activities were not a source of economic vitality in the Fond du Lac Reservation area. Unfortunately, those land-based economic activities often were the source of job and income loss.

The local economy surrounding the Fond du Lac Reservation, however, *did* expand significantly. We need to look at those sectors that were able to expand despite the shrinkage in the traditional export base to understand the other local sources of economic vitality.

ii. Government

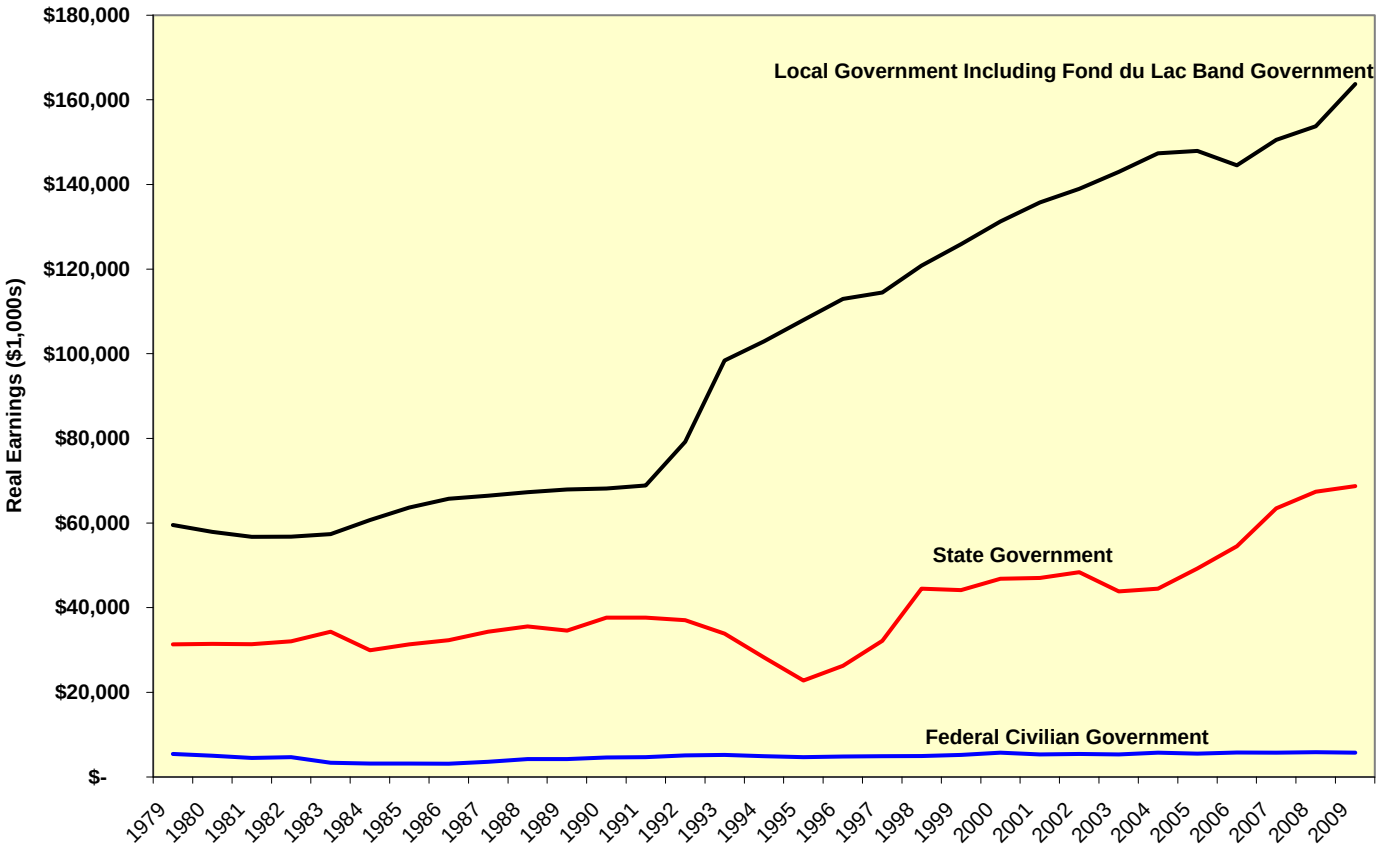
The sector of the local economy surrounding the Fond du Lac Reservation that expanded most significantly over the last four decades was “government,” including the federal, state, county, municipal, and Reservation governments. Some might see this as a non-sustainable weakness of the local economy because government activities rely on obtaining revenues from taxes on private households and businesses.

Those communities adjacent to military bases, state prisons, institutions of higher education, National Parks and Forests, etc. as well as Tribal resorts and casinos are likely to dispute this characterization. These government institutions provide valuable services that most citizens would not want to do without or run the equivalent of productive businesses that generate significant profits that are returned to the local economy. In that sense, these are valuable economic activities that have positive impacts on adjacent communities.

It is important to understand that most of the growth in government payrolls is not directly related to the federal and state government payrolls. Between 1979 when local government payrolls began to be reported separately and 2009, federal government payrolls increased hardly at all (+$353,000). State government payroll increased much more significantly, about $37 million dollars. But local government payrolls, including those associated with the Fond du Lac Reservation government increased by about $104 million. Almost three-quarters (73 percent) of the increase in government payrolls was associated with local government activities. See Figure 7.

Figure 7

Composition of Government Payroll: Carlton County, MN



In 2010 the Fond du Lac Band paid salaries to over 2,100 individuals for a total payroll of over $58 million. Over 60 percent of these Fond du Lac Band employees lived in Carlton County. Another 28 percent lived in St. Louis County, including in Duluth. Another 6 percent lived in Douglas County where Superior is located. These three counties accounted for over 96 percent of Band employees and salary payments. In 2009 total local government payrolls in Carlton County were $164 million and local government employees numbered 3,700.

iii. Services

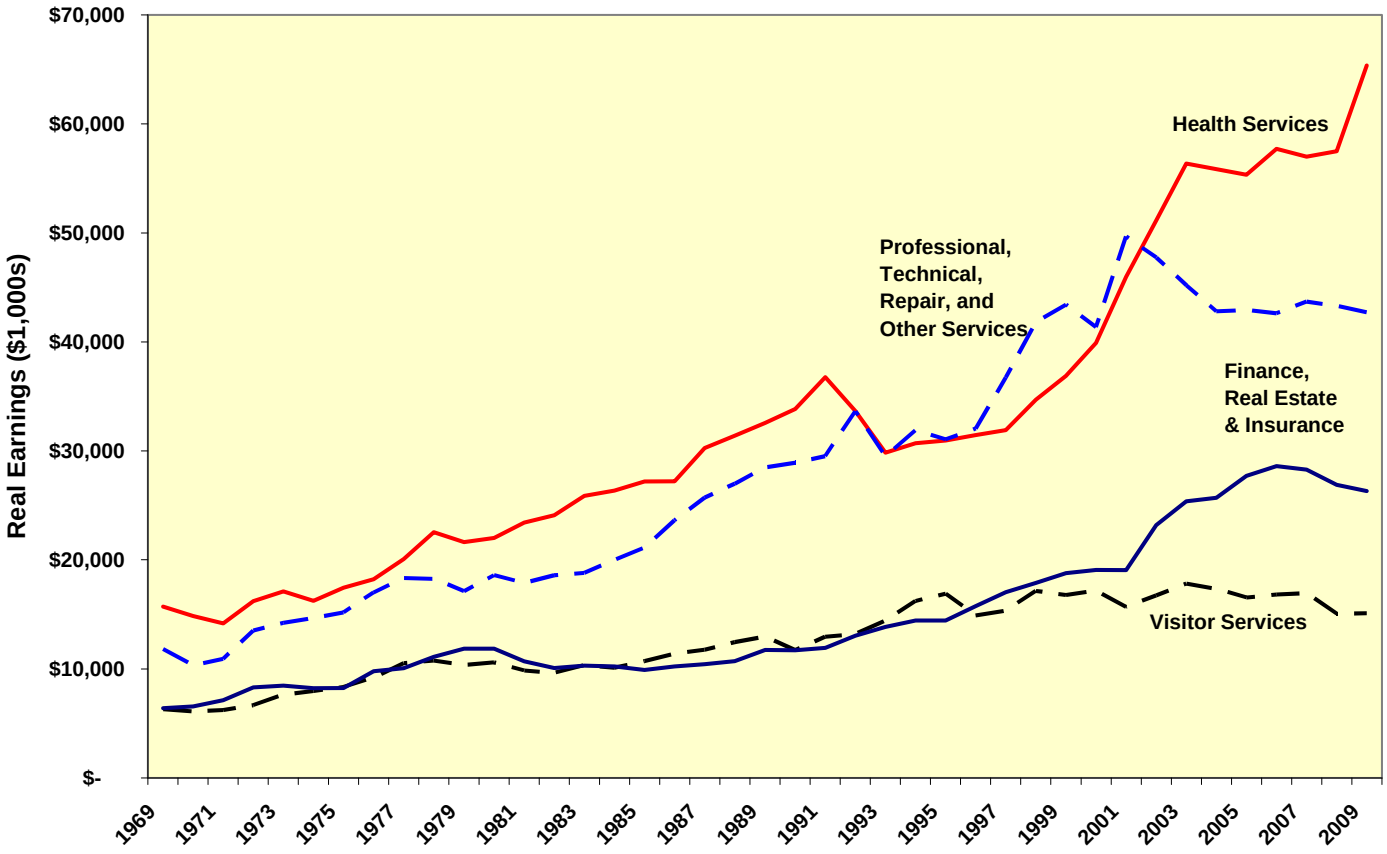
Although "services" are often casually assumed to be relatively low paid, dead-end jobs, typically characterized as "burger flipping" this is a misleading characterization. Service jobs, like manufacturing, forestry, or construction jobs, *do* include many low paid, even minimum-wage, jobs. But like these other sectors, services also include many high-paid professional and technical jobs. Education, for instance, can include day care workers who are paid minimum wages but also include well paid professionals and

administrators. Health services include relatively low paid orderlies, laundry, and cafeteria workers as well as physicians, nurses, and technologists.

Health services in Carlton County was the source of slightly more than 10 percent of jobs and wages in 2009, employing more than 1,800 workers. Between 2001 and 2009 it added almost 400 additional jobs and $29 million in payrolls. Employment and payroll in health services has grown in an accelerated manner despite the slowdown in the overall economy during the 2000s. See Figure 8 which shows the payroll associated with health services as well as other services.

Figure 8

The Growth of the Service Sectors: Real Earnings, Carlton County, MN



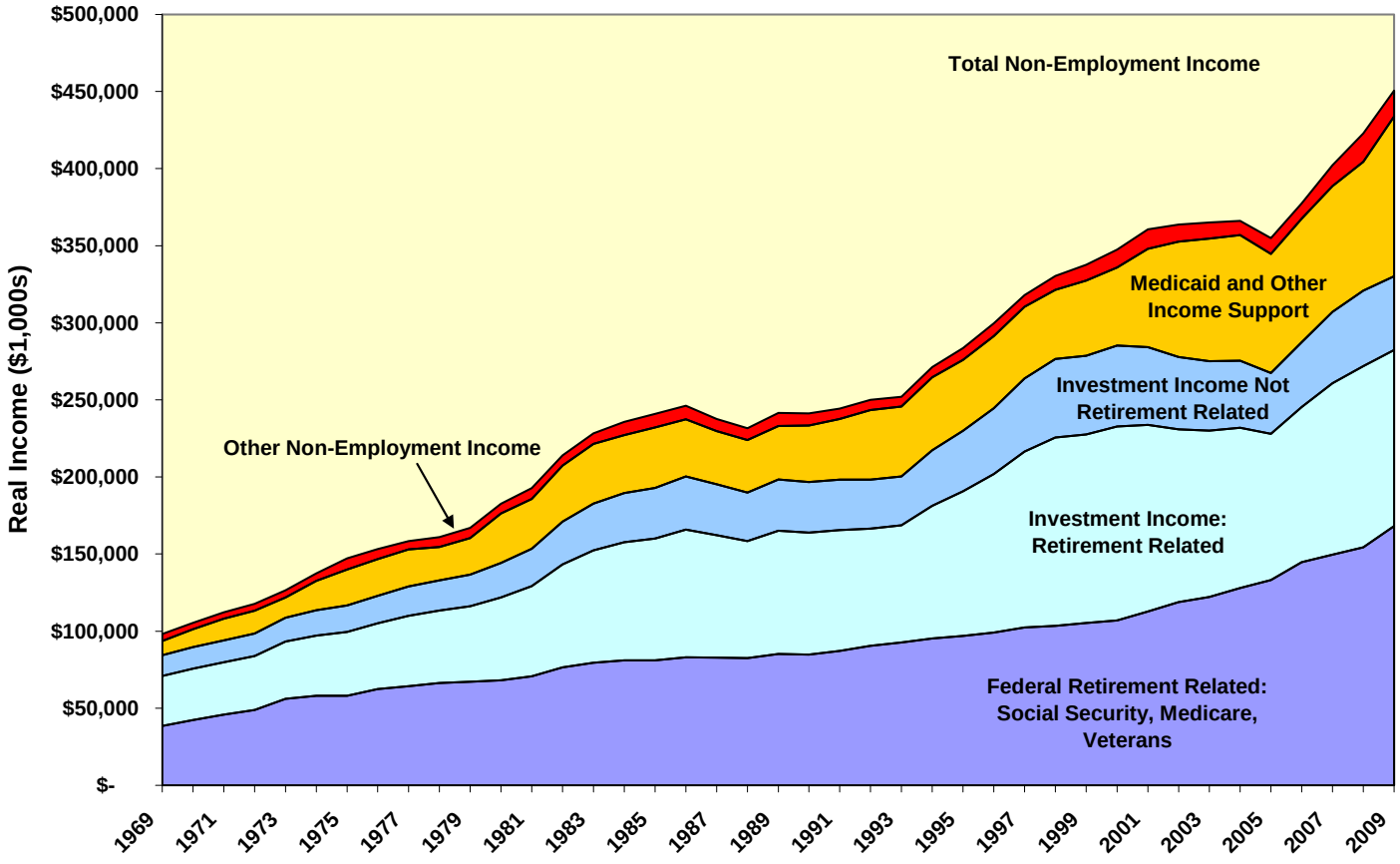
Health services are just one of the professional and technical services. Services also include legal, education, social, management, computer, business, administrative, and repair services among many others. For most of the last four decades the payrolls from these other services grew in real, inflation adjusted, terms in a manner similar to health services, with real payrolls increasing fivefold between 1970 and 2001, from $10 to $50 million. During the 2000s these services dipped about $8 million and stabilized at that lower level during the "Great Recession." See Figure 8.

Financial services, including banks, investment firms, insurance, and real estate, also saw significant payroll growth in real terms, increasing over four fold from $6.5 million to $29 million between 1970 and 2006 before the financial and real estate crises forced a modest decline of $2 million through 2009.

Finally visitor services measured by the payroll of sectors primarily serving visitors without seeking to estimate a share of retail trade and services spending tied to visitor spending has also risen steadily over the last four decades, almost tripling in real payroll between 1970 and 2003 to $18 million. Between 2003 and 2009 visitor service payrolls have declined by about $2.7 million although the number of jobs has been relatively constant at about 1,400. Explore Minnesota, the state tourism promotion office, also estimated the employment in visitor services to be relatively stable between 2005 and 2009 at a slightly lower level, 1,100. See Figure 9.

Figure 9

Trends in Real Non-Employment Income: Carlton County, MN



The changes in the American economy over the last half-century have often been described in terms of a “shift to services” or the rise of a “services economy.” The growth of almost all of the services sectors in the Fond du Lac Reservation area economy over the last 40 years shows that this national trend has also transformed that regional economy. Health and other professional, technical, financial and repair services, visitor services, and government, especially local government, have all expanded significantly. The labor earnings in this set of service sectors made up about 29 percent of payrolls 40 years ago in Carlton County but now represent 62 percent of payrolls. Meanwhile the role of land-based economic activities and manufacturing has shrunk from 53 percent to 17 percent of payrolls. Clearly there has been a dramatic shift to services in the Fond du Lac Reservation area just as there has been in the nation as a whole.

iv. Retirement, Investment, and Other Non-Employment Income

Retirement-related income has grown significantly in the Fond du Lac Reservation area both because over the last four decades more people have spent their entire working life contributing to public and private retirement programs and because the number of retirees has been growing. As a result, since 1969 the retirement income received by residents of Carlton County has increased from $32 million to $114 million in inflation adjusted terms. That is a four-fold increase. We are including in this total federal social security payments, Medicare reimbursement of medical costs, veterans benefits, and other federal retirement payments. Private pension fund payments are reported as investment income. We have estimated that approximately 70 percent of investment income is retirement-related. Another $48 million of investment income was paid to residents of Carlton that was not related to current retirees. See Figure 10.

Federal and state governments also make payments to individuals in economic difficulty. Unemployment compensation payments to laid-off workers and the medical bills of low income families, especially low income children, are two examples. The latter of these, Medicaid, has been growing steadily just as medical costs have been across the American economy. Although no community would welcome the economic situations that trigger these income flows, unemployment and poverty, one of the intended consequences of these payments *is* to support local families and the communities in which they live. These federal and state income support programs, especially Medicaid, have grown significantly over the last several decades but represent a minority of total non-employment income, 23 percent. Over three-quarters of non-employment income is associated with retirement and investment income.

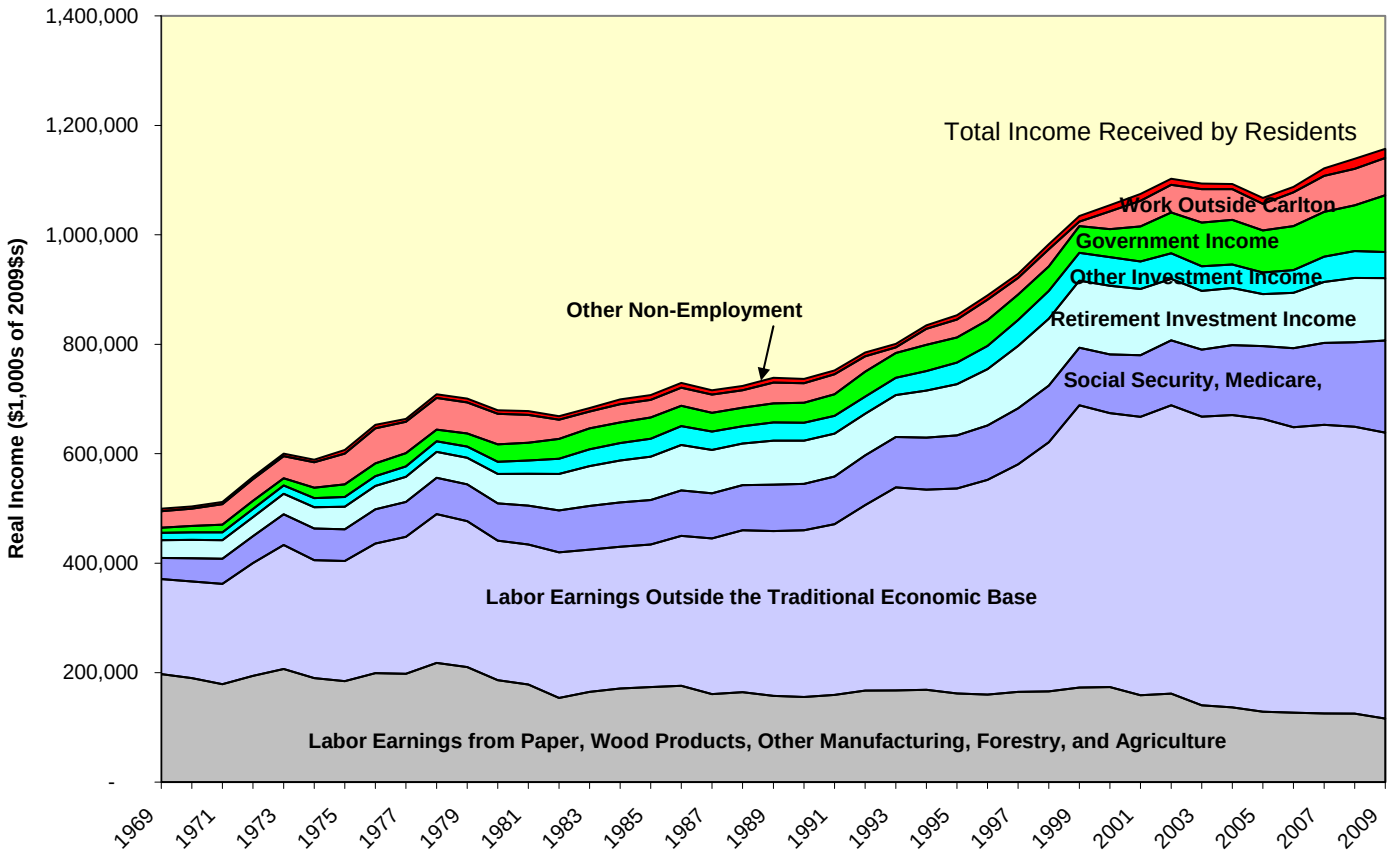
v. Summary of the Long Term Trends

Over the last four decades, 1969-2009, wages and salaries earned in the traditional economic base in the Fond du Lac Reservation area have slowly but steadily declined. Total real payrolls were able to expand despite these losses because government, especially local government including the Fond du Lac Reservation government and the service sectors, especially health, technical, and professional services, steadily

expanded their payrolls. By 2000, however, the growth in real payrolls stabilized and then declined slightly. Despite this limited growth in payrolls within the Carlton County economy, total real income continued to increase. This was possible as a result of the growth of retirement income, workers choosing to live in Carlton County and commute out to work, the growth of investment income, and the growth in government income support programs. See the figure 9.

Figure 10

Sources of Real Personal Income: Carlton County, MN



This long-run pattern underlines the need to focus on the actual sources of economic vitality in the region surrounding the Fond du Lac Reservation rather than focusing attention on the sources of economic vitality in the distant past. These long-run economic trends underline the following as the actual sources of local economic vitality:

a. The rise in the importance of the service sectors of the economy including medical, professional, technical, repair, financial, and visitor services.
b. The increasingly important role of local government including the Fond du Lac Reservation government.
c. The increasing importance of retirement income.

d. The increasing role of other sources of non-employment income including investment income and government income support programs.
e. The importance of households choosing to live in Carlton County while commuting out to work.

6. The Economic Importance of Amenities in the Fond du Lac Reservation Area

In the previous sections of this report have documented why it is important in local economic analysis not to focus exclusively on export-oriented commercial economic activities. Such an exclusive focus on demand for labor in specialized export industries may be appropriate in extreme "frontier" or "colonial" economies. But those are extreme cases that almost no one would hold up as an economic ideal. Both economic theory and empirical economic research underline the importance of not focusing on a pre-determined set of economic activities that were historically important but rather to look closely at what all of the sources of income flowing into a local economy are. In addition, it is important to recognize the importance of locally-oriented economic activity in helping to hold and circulate the income that does flow into the local economy. That is the source of the "ripple" or "multiplier" impacts. Finally, people do not just passively follow jobs. Jobs also follow people because people's preferences for what they perceive to be higher quality living environments help determine the location of the labor force and local markets for goods and services. Both of these are important determinants of the location of economic activity.

In that sense the attractiveness of the Fond du Lac Reservation area as a place to live, work, and do business is relevant to local economic vitality in several different ways:

i. Attracting and Holding Businesses

Businesses have to be concerned about the availability of the workers with the skills and experience that a business needs to operate or expand operations. The *cost* of attracting the quality of workers businesses need also matters. If an area is one in which workers and their families would rather not live, firms will have to pay the equivalent of "battle pay" to attract and hold the workers they need in that area. On the other hand, if the area, because of the local social, cultural, natural, and human-created amenities, is quite attractive to workers and their families, firms will have no difficulty obtaining the quality workforce they need without paying a premium to "bribe" workers into moving to the area or staying in the area. Firms have to be concerned about the availability and cost of the workers they need. Local amenities impact both...

ii. Attracting and Holding Working-Age Residents

The in-migration of working-age individuals and their families can have a stimulating impact on the local economy. In-migrating families typically bring with them capital in the form of savings, including the income they received from the sale of their previous home. In the process of setting up a household and seeking jobs, the in-migrants spend money that stimulates the local economy. Empirical estimates indicate that a working

age in-migrant can have an impact that creates the equivalent of one new job. In addition, ongoing in-migration creates expanded markets for goods and services that allow increased specialization and expansion of the local business infrastructure that, in turn, allows the economy to capture and hold more of the income generated by reducing income leakage out to fund imported goods and services. In-migration can also increase the labor supply, somewhat reducing the pay levels for workers of all skills, making the area an attractive location for new firms.

Between 2000 and 2009 the Carlton County's population grew by an estimated 2,700. Some of this growth was due to "natural growth," births exceeding deaths. But most of it, 81 percent, was associated with the net in-migration of new residents.[35] Net domestic migration was the difference between those moving in and those leaving. The net domestic in-migration (movement from other U.S. counties) added 6.1 percent to the population, which was the 11th highest rate of in-migration among Minnesota's 87 counties. Five of the top ten counties were in the Greater Minneapolis region and two in the Greater St. Cloud area.

Projections of future population growth in the Fond du Lac Reservation area suggest that this competitive success in attracting new permanent residents is likely to continue if the basic amenities of the area are protected or enhanced. Population growth in the Fond du Lac area (Carlton County) is projected to be among the top dozen Minnesota counties outside of the Minneapolis-St. Paul suburban ring. Between 2005 and 2035 Carlton County population is projected to grow by 35.4 percent. Pine County to the south is projected to grow 28.6 percent, Aitkin to the west, 20.3 percent, and Crow Wing further to the west, 34.8 percent. The state as a whole is projected to grow 24.2 percent during the same time period. St. Louis County is the only county in the region around the Fond du Lac Reservation where projected population growth is well below the average for the entire state. St. Louis County's population is projected to grow hardly at all, 1.6 percent, during that 30 year period.[36] This is largely due to the difficulties the Duluth area as well as the Iron Range have had in making the transition to a more diversified economy as growth in employment opportunities in mining, mineral processing, and manufacturing have slowed or actually declined. This is not a problem unique to St. Louis County. Other manufacturing and mining centers across the nation have faced the same difficulty in making the transition to a new economic base.

Clearly over the last decade Carlton County has been a highly competitive attractive location for new residents to settle in Minnesota.[37] Maintaining the current competitive

[35] Table 4: Cumulative Estimates of the Components of Resident Population Change for Counties of Minnesota: April 1, 2000 to July 1, 2009 (CO-EST2009-04-27), U.S. Census Bureau, Population Division, released March 2010.
[36] Projected Minnesota Population by County, Minnesota State Demographic Center, 2007.
[37] This has not always been the case. During the 1995-2000 period, in-migrants and out-migrants to and from Carlton County almost exactly matched, about 5,000 of each, contributing almost nothing to population change. The three-county Duluth metropolitan region, however, did gain population from net in-migration during that time period. Table 2, Net Migration for the Population 5 Years and Over for the United States, Regions, States, Counties, New England Minor Civil Divisions, and Metropolitan Areas: 2000, Census 2000 PHC-T-22 Migration for the Population 5 Years and Over.

advantage by maintaining the quality of life that draws and holds residents to the Fond du Lac Reservation area will continue to be important to local economic vitality.

iii. Attracting and Holding Retirees

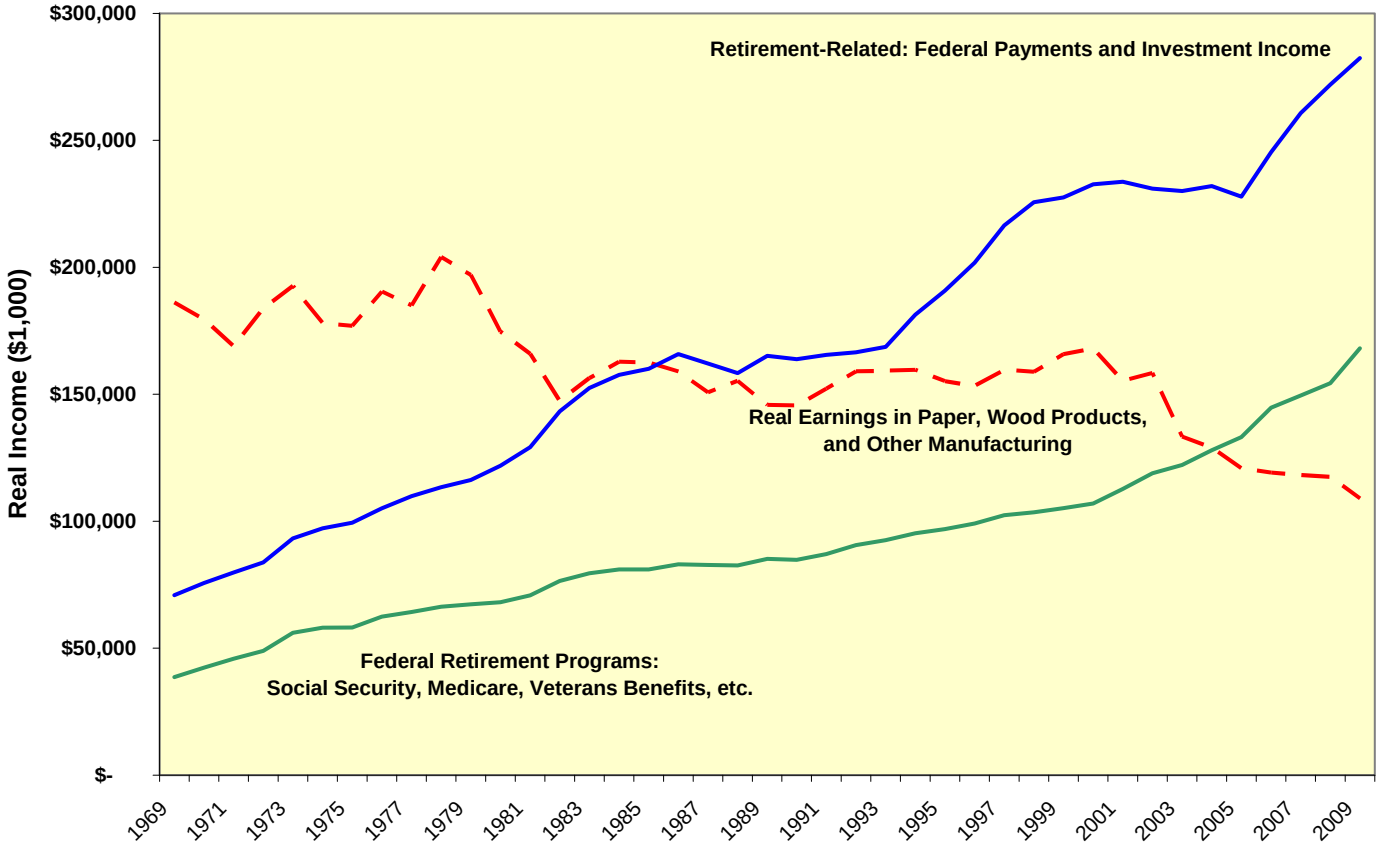
Those reaching retirement age can partially choose their residential location independent of the employment opportunities an area may provide. Their retirement income follows them, whatever that location decision is. Retirees, therefore, can focus more on where they would *like* to live and what the amenities are that various alternative locations have to offer. Some straightforward economic considerations are still important including the local cost of living and, in particular, the local cost of housing, easy access to high quality health care, and the potential for part-time employment to supplement retirement income. But local quality of life and the myriad of local amenities are also very important. The spending of in-migrating retirees stimulates the local economy in the same way any injection of income from outside the area does. As that income circulates locally it puts others to work generating additional income. To the extent that the retirees are entirely out of the labor market, they do not fill the local jobs they themselves create.

The 2010 Census data on change in population by age and in-migration is not available at this writing (May 2011). The U.S. Census Bureau, however, does provide estimates of the change in population by age at the county level. As discussed above, we know that 81 percent of the population growth in Carlton County was associated with net migration into the county between 2000 and 2009. All of that growth in population (and more) was associated with people over the age of 45 (2,841 of the total increase of 2,656). There was a loss of population in the age 5 through 14 group. If we approximate the age 55 through 64 growth in population by taking half of the age 45-64 increase, then the growth in population in those 55 and over was about 1,650. That would represent over 62 percent of all of the growth in Carlton County, most of which came from net in-migration. In that sense, people approaching retirement age were being attracted to the Fond du Lac Reservation area where they either retain their residence or move in for retirement.

As pointed out above, the impact of retirement-related income on the Carlton County economy has been substantial. By the 2004 the payments from federal government retirement programs such as Social Security and Medicare were a larger source of income to residents of Carlton County than the payrolls associated paper, wood products, forestry, and other manufacturing. If the estimated part of investment income that is retirement related is added to this federal retirement income, retirement-related income surpassed all manufacturing payrolls in 1986 and is now over twice as large. See Figure 11.

Figure 11

Retirement-Related Income and Earnings from Manufacturing: Carlton County



iv. Developing a Sustainable Visitor Economy around Local Amenities

High quality social, cultural and natural amenities not only attract new permanent residents but also attract visitors. The "visitor economy" includes a wide variety of different types of visitors from professional and business meetings to those focused on outdoor recreation to those seeking unique cultural experiences. Of course, there are also people who come in from smaller towns and rural areas to shop, attend sports events, and/or enjoy an evening of entertainment at Cloquet's restaurants, resorts, and casinos.

Tourism can be on an "industrial scale" that attracts large volumes of visitors who tend to overrun local businesses and facilities and create a homogenous experience that could be replicated almost anywhere. That sort of tourism can degrade the quality of life for residents as well as visitors, undermining the attractiveness of an area.

Communities, recognizing that tourism can be a threat as well as an economic benefit, have tried to become more discriminating in the type of tourism they have encouraged.

A variety of different names have come to be applied to types of more focused and sustainable visitor economies that are consistent with sustaining and not degrading the unique aspects of a community: ecotourism, community-based tourism, cultural visitors, heritage traveler, etc. The term that seems to have been adopted to represent all of these types of tourism that explicitly seek not to threaten the unique qualities that are drawing the visitors to an area is *geotourism*. It has been defined as: Tourism that sustains or enhances the geographical character of a place—its environment, culture, aesthetics, heritage, and the well-being of its residents." [38]

The development of these types of sustainable tourism and their embrace by the Travel Industry Association of America reflects the negative connotation that has come to be associated over the years with conventional "industrial scale" tourism. Instead of disrupting communities and creating mostly part-time low-paid jobs for in-migrating young people, the focus is on visitors and activities that are specifically compatible with local characteristics and that maximize local economic benefits. The cultural diversity and richness of the Fond du Lac Reservation area, its combination of small city and rural lifestyles, and its surrounding rivers, wetlands, lakes, and protected public lands lay the basis for a productive expansion of geotourism in the Fond du Lac Reservation area.

The travel industry is a very important part of the economies of both the state of Minnesota and its Arrowhead region of which Carlton County is a part. Estimates by the University of Minnesota in 2010 indicated that tourism generated close to 250,000 jobs statewide as a result of $11.2 billion in leisure and hospitality sales which also generated almost $700 million in sales taxes. A poll of Minnesota citizens at the same time indicated that the tourism industry was widely recognized as an important part of the Minnesota economy with 70 percent of respondents indicating that tourism was "very important," while "a whopping 99 percent say they see it as either 'important' or 'very important' to the state's economy."[39]

Tourism also plays a major role in the northeastern "Arrowhead" region of Minnesota which includes Carlton County. During the June 2007 through May 2008 period, 33,500 full-time-equivalent jobs were supported generating personal income for residents of almost $667 million and contributing $60 million to local government revenues.[40] The University of Minnesota-Duluth's Bureau of Business and Economic Research has estimated that tourism is responsible for 11 percent of the total economic value

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[38] See "Geotourism: The New Trend in Travel," National Geographic and Travel Industry Association of America, 2003.. http://www.egret.us/clinton/Geotourism%20The%20New%20Trend%20in%20Travel.pdf . Also see http://en.wikipedia.org/wiki/Geotourism

[39] UM News, "Minnesotans view tourism as "very important." http://www1.umn.edu/news/news-releases/2010/UR_CONTENT_182863.html

[40] "The Economic Impact of Expenditures by Travelers on Minnesota's Northeast Region and the Profile of Travelers: June 2007—May2008," Davidson-Peterson Associates, prepared for Explore Minnesota Tourism, State of Minnesota, http://www.tourism.umn.edu/prod/groups/cfans/@pub/@cfans/@tourism/documents/article/cfans_article_127037.pdf .

produced in the eight county northeastern Minnesota region in 2007. Its size was approximately the same as that of the forest products industry.[41]

Travelers'' expenditures in Carlton County in 2007-2008 have been estimated at almost $72 million. Businesses serving those visitors created about 1,100 full-time-equivalent jobs that paid workers $19 million and generated local tax revenues of $1.7 million. If "ripple" or multiplier effects are taken into account the total full-time-equivalent jobs created would be 1,500, the total payroll $30 million, and the total local tax revenues $2.7 million. This would represent about 11 percent of employment and about 5 percent of earnings in Carlton County in 2008.[42]

The difference between the employment and earnings percentages reflects the relatively low annual pay associated with jobs in the visitor economy. This is clearly a drawback associated with the visitor economy, but it is important to keep in mind that these jobs are often seasonal and part-time jobs that provide entry-level employment for young people and those returning to the workforce or those for whom part-time and seasonal work are preferred because the workers have other economic commitments at school, at other jobs, or within the home. For those workers, the flexibility of these jobs is an advantage that allows them to pursue *some* employment while pursuing other objectives. This can be valuable to those workers despite the low annual pay. Part-time and seasonal jobs are part of the suite of employment opportunities that help potential workers match their needs, work experience, and preferences with those of the labor market. Young workers or those who have been out of the workforce for an extended period need such entry level jobs. They do not spend but a small part of their work lives in such jobs before moving up the occupational ladder. But having such entry level positions available is crucial to developing their work experience so that they can move on to higher paid jobs. It is in that way that such low paid jobs can actually boost local income rather than reduce it.

If the relative importance of the travel economy in supporting the local economy is judged by the number of dollars spent by visitors or the number of people employed due to that spending, the places where the visitor industry appears to be most important are the larger cities of Minnesota: the Greater Minneapolis, Duluth-Superior, Fargo-Moorhead, St. Cloud, and Rochester urban areas. But if the size of the visitor sector is judged relative to the overall size of the local economy, one sees a different picture of where the visitor industry is most important to the local economy.

Put on the basis of visitor spending or visitor sector employment per permanent resident, seven of the top dozen counties in Minnesota are counties in northeast Minnesota, led by St. Louis County which, of course, also is the second largest

[41]Table 1, p. 14, "The Economic Impact of Ferrous and Non-Ferrous Mining on the State of Minnesota," on the Arrowhead Region and Couglas County, WI, March 2009, http://www.ironrangeresources.org/_site_components/documents/user/aboutreports-publications230.pdf.

[42] Visitor sector total labor earnings are compared to total earnings in Carlton County in 2008. Total full-time-equivalent jobs in the visitor sector are compared to the total number of employed persons in Carlton County in 2008.

population center. Carlton County is *not* in that top dozen counties in terms of the size of the visitor sector relative to the size of the local economy. Carlton County, interestingly, is surrounded by counties in the top dozen: Pine to the south, Aitkin and Crow Wing to the west, and St. Louis to the east and north. In Carlton County the visitor sectors are only about half as important relative to the overall size of the county economy as the counties at the bottom of the top dozen counties. This may suggest that Carlton County has considerable room to grow its visitor sectors.

There is another aspect of the visitor economy that is important in the Fond du Lac Reservation area: The growth of vacation, seasonal, or second homes. Over the last four decades the number of second homes has quadrupled from 334 to 1,369. During that time period about one in every six new homes built were seasonal home. The percentage of homes that are seasonal homes has risen from about 4 percent to 9 percent.[43] These homes represent something in between a permanent resident and a temporary visitor. Second home owners spend considerable money building and maintaining their vacation homes as well as provisioning the home while they are living there. At the time of retirement, those second homes often become retirees' permanent residences. See Figure 12.

7. Economic Conclusions about the Fond du Lac Reservation Area: A Summary

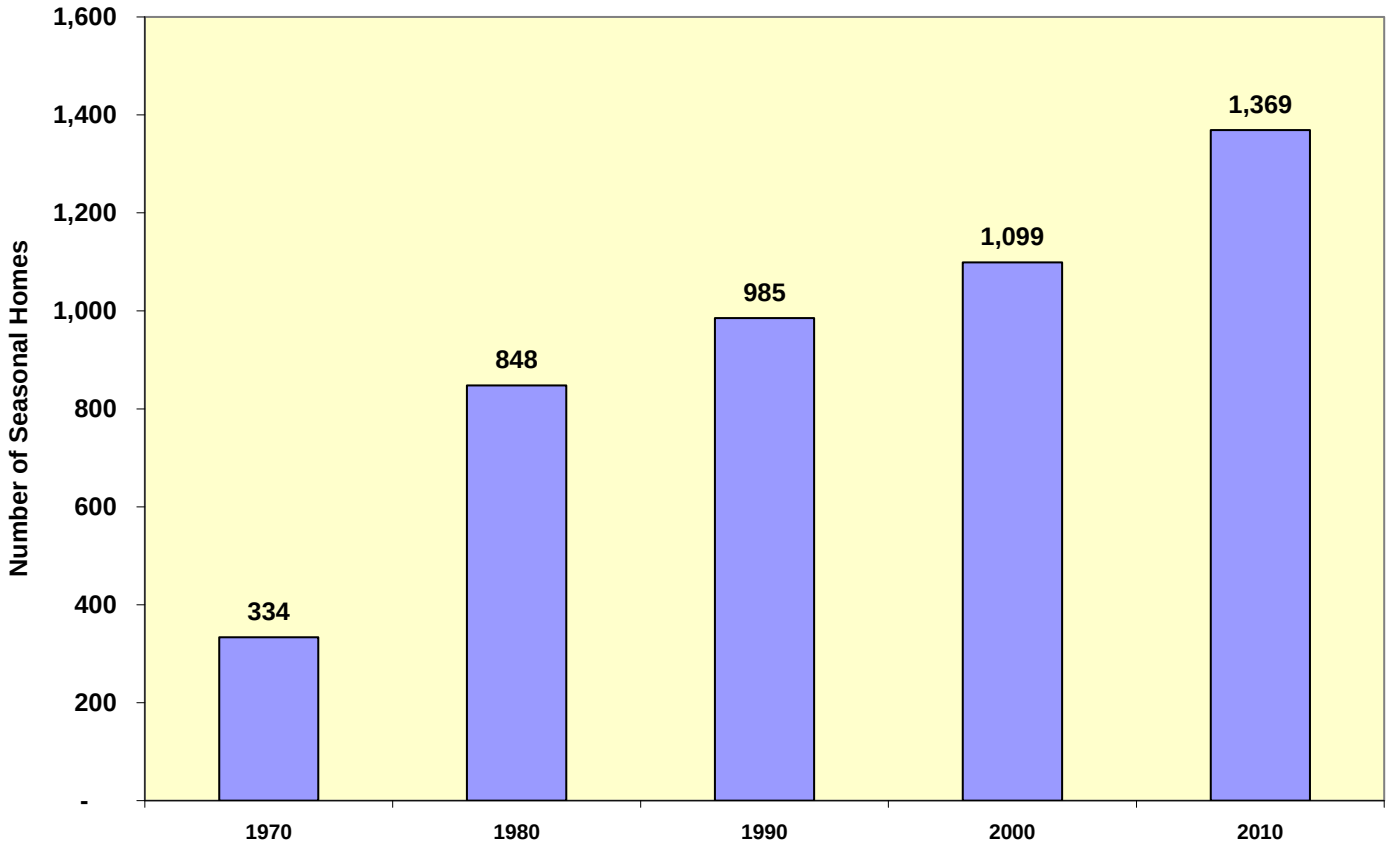
We have used Carlton County to indicate the economic and demographic trends affecting the Fond du Lac Reservation Area. The socioeconomic characteristics and trends we have discussed are important in understanding the likely impact of a Class I air quality re-designation of the Reservation under the Clean Air Act. Here we wish to summarize the more important of those socioeconomic characteristics and trends.

i. For a good part of the last half-century, the economy in which the Fond du Lac Reservation is embedded has been slowly but systematically shifting away from one centered on land-based economic activities such as forest products (forestry, logging, paper and wood products) and agriculture. As employment and payrolls associated with these activities have declined, jobs and income associated with health and other professional, technical, financial and repair services have increased as have local government payrolls (including the government of the Fond du Lac Reservation) and visitor services (including, again, that from the Fond du Lac Black Bear Resort and Casino). The growth in these expanding sectors has offset the declines in the shrinking sectors allowing overall employment to expand as the economy has been transformed.

[43] 1970 to 2010 Census of Housing. In the Census, "unoccupied" homes at the time of the Census (April 1st) are counted and then the reason they are unoccupied is noted. One of the categories is "seasonal, recreational, or occasional use." This is broadly interpreted to mean the home is a second home used for recreational purposes.

Figure 12

The Growth in Seasonal Homes in Carlton County, MN



ii. Carlton County over the last decade has been quite successful in attracting and holding new residents through net in-migration. This has contributed significantly to local economic vitality.

iii. Income not associated with current employment, i.e. non-employment income, has expanded dramatically. Most of this is retirement and investment income that follows people as they make residential location decisions. Over 40 percent of income received by residents of Carlton County comes from these non-employment sources.

iv. A significant number of people who work outside of Carlton County have chosen to live in Carlton County rather than in the county where they work. This creates a flow of income from surrounding counties into Carlton County.

v. A significant number of retirees have chosen to live in Carlton County. This creates a flow of income from Social Security, Medicare reimbursements, other pensions and investments into the local economy.

vi. The visitor economy has become increasingly important to the Fond du Lac Reservation area. The casinos and resorts the Fond du Lac Band have constructed and operate are an important part of this as are the growing number of second homes that serve regular visitors to Carlton County.

vii. The expanding service economy that has been the primary source of job creation and income generation has partially been made possible by the increasing permanent population of and number of visitors to the Fond du Lac Reservation area. The increased diversity and sophistication of the Cloquet urban economy has contributed too, allowing the area to more successfully retain and re-circulate income that flows into the county.

These changes in the economy of the Fond du Lac Reservation area underline the importance to the area's ongoing economic vitality of protecting and enhancing the site specific characteristics, the local amenities that make the area an attractive place to live and visit. Among those amenities are clean air and water and the productive natural landscapes and wildlife they support. It is to the economic importance of these that we now turn.

IV. Implications of Fond du Lac Class I Air Quality Status for the Duluth-Superior Urban Area

1. Introduction

Because the eastern boundary of the Fond du Lac Reservation lies only about a dozen miles from the western boundary of the city of Duluth and only about five miles further from the city of Superior, it is likely that residents of Duluth-Superior area will be interested in what the implications are of the Reservation being redesignated as a Class I air quality area. For that reason, this section of the report will explore what stricter air quality standards on the Fond du Lac Reservation may mean for economic development in Duluth-Superior urban area just to the east of the Reservation.

First we look at the primary sources of air pollution in the Duluth-Superior area. We then explore what the role of those polluting industries is in the Duluth-Superior and regional economies. We look at this in a dynamic context, asking how the more heavily polluting industrial sectors have performed in recent decades as sources of jobs and income in the Duluth area. We also look at the present and the near future to see what industries are likely to be the sources of *new* jobs and income. Finally we look at the economic role of environmental quality and quality of life in supporting the economic competitiveness of the Duluth-Superior urban area in the national economy.

2. The Largest Sources of Air Pollution in the Duluth-Superior Area

We used the Minnesota Pollution Control Agency's and the Wisconsin Department of Natural Resources' data bases on point sources of air pollution to determine the top 20 air polluters in the Duluth-Superior urban area within 20 miles of center of the City of Duluth.[44] The air pollutants that are directly limited by Class I air quality standards are nitrogen oxides (NOx), sulfur dioxide (SO2) and particulates (both PM-10 and PM-2.5). We therefore focused our attention the emissions of these pollutants from facilities in the Duluth area. The latest reporting year in this database was 2010.[45]

There were four facilities in the Duluth-Superior area that had emissions of 350 to 800 tons per year of these pollutants. The other "largest" polluters had emissions of less than 50 tons per year of these pollutants. We, therefore, focused on those facilities with very large air pollution emissions. The regulations governing areas reclassified as Class I air quality limit the impacts of single new sources of air pollution rather than seeking to impose limits, for instance, on the cumulative impact of a large number of smaller sources of air pollution.

The largest polluting firms in the Duluth-Superior area are in familiar "smokestack" industries:

- The largest source of NOx and SO2 is the Graymont Limestone Plant in Superior Wisconsin. The lime calcining plant takes limestone and converts it to lime through a kiln drying process.
- The Murphy Oil Facility is Superior was recently sold (mid 2011) to Calumet Specialty Products Partners. The petroleum refinery has the ability to refine up to 45,000 barrels of oil a day.
- Duluth Steam Cooperative Association uses coal-fired boilers to produce steam to heat and cool about 200 buildings in downtown Duluth.
- Minnesota Power's Hibbard Renewable Energy Center, which burns wood to generate electricity and provide a paper mill with steam, is the largest source of carbon monoxide and lead.
- Georgia-Pacific's hardboard plant, which uses wood waste to produce engineered building and furniture material, is the source of significant amounts of carbon monoxide, lead, particulate, and sulfur dioxide.
- Wisconsin Central Ltd. operates the Duluth Ore Dock, an iron ore loading facility. That facility also releases significant amounts of particulate pollution.
- ME Global Elecmetal operates a steel and iron foundry that produces very large pieces of equipment using electric arc furnaces. Its production processes release significant amounts of particulate pollution into the air.

[44] Since our intended focus was on the Duluth-Superior area, we purposely did not include polluting industrial facilities immediately adjacent to the Fond du Lac Reservation. In particular we did not include the Sappi Fine Paper mill in Cloquet. That Sappi mill is a larger source of NOx, PM10, and SO2 on a tons per year basis than any of the larger air polluting facilities in the Duluth-Superior urban area.
[45] http://www.pca.state.mn.us/index.php/data/air-quality.html and http://dnr.wi.gov/air/

The only major sources of air pollution in the Duluth-Superior area that do not fall into a traditional "smokestack" industry is the University of Minnesota-Duluth (UM-D) and the University of Wisconsin-Superior (UW-S). UM-D is a major emitter of particulate pollution from the campus boilers that provide heat to campus buildings. The university also has seven emergency backup electric generators that are a source of air pollution when they are operated, but they are restricted to operating a very small number of hours per year. The boilers and the backup generators burn either natural gas or fuel oil. The campus heating plant at UW-S is also a significant, but much smaller source, of all three pollutants.

Table 5 below lists all of the largest air pollution sources in the Duluth-Superior urban area. It includes all of the emitters of NOx, SO2, and PM10 that were among the top twenty emitters of one or more of those pollutants.

3. The Likelihood of Such Air Pollution Sources Violating Class I PSD Standards on the Fond du Lac Reservation

The Fond du Lac Band had Air Resource Specialists, Inc. model the impact of a large source of NOx, SO2, PM10 and PM2.5 in the Duluth area just east of the Reservation on Class I PSD increments on the Reservation.[46] Air Resource Specialists modeled hypothetically locating a very large, 630 megawatt, natural-gas-fired combined cycle combustion turbine electric generating plant 25 miles east of the Reservation at the existing Minnesota Power ML Hibbard Energy Station, where a wood-fired electric generator currently operates.[47]

Such a facility would produce significantly more emissions of NOx, SO2, and particulate pollution than the largest of the existing Duluth-Superior facilities shown in Table 5 above. That air quality modeling demonstrated the impact on the Reservation's air quality of a much larger incremental source of pollution than is likely to actually be built in the Duluth-Superior area.[48]

Table 6 shows a comparison of the hypothetical large new source and the largest sources of emissions in the Duluth-Superior urban area. The hypothetical large new source is significantly larger than even the largest single source of emissions (the Graymont lime facility) which is in turn significantly larger than the next closest source of emissions (Murphy Oil).

[46] "Energy Impact Analysis in Support of Class I Redesignation Requests," Air Resource Specialists, Inc., May 2011.
[47] The distance was measured from the Hibbard Energy Station to the center of the Reservation, not its eastern boundary which is much closer.
[48] As Air Resource Specialists pointed out: "It should be noted that a hypothetical plant at this location probably far exceeds any real energy needs at this site going out through the foreseeable future." Minnesota Power has never proposed building such a facility at this hypothetical location. P. 2-1 and 2-2.

Table 5

Large Air Pollution Sources within 20 Miles of Duluth, MN, 2010				
	Pollutant (Tons per Year)			Distance from the Center of Duluth (miles)
Name of Facility	NOx	PM10	SO2	
Graymont LLC. (WI)	526	98.3	657	4.0
Murphy Oil-Winter ST. Faclility (WI)	417	157	329	6.7
Duluth Steam Cooperative Association (MN)	383	27.4	403	0.2
University of Minnesota - Duluth (MN)	0.00	158	0.00	2.1
Georgia-Pacific - Duluth Hardboard (MN)	0.005	47.2	19.3	1.0
Wisconsin Central Ltd - Duluth Ore Dock (MN)	0.00	43.4	0.00	3.0
ME Global Inc/Elecmetal Duluth (MN)	16.0	39.5	8.06	10.3
BNSF RAILWAY CO (WI)	0.00	20.9	0.00	8.3
Midwest Energy Resources Co. (WI)	0.00	17.7	0.00	3.5
Duluth Paper Mill & Duluth Recycle Pulp (MN)	0.00	14.4	0.00	4.8
Northland Constructors of Duluth LLC (MN)	13.3	2.68	0.880	6.1
WIS DOA / UW-Superior Power Plant (WI)	12.5	7.64	34.6	4.8
Hallett Dock Co - Dock 5 (MN)	0.00	12.4	0.00	3.2
Minnesota Power Inc - Hibbard (MN)	0.151	12.3	460	4.3
Tate & Lyle Ingredients Americas Inc (MN)	5.00	11.6	0.03	7.5
BendTec Inc (MN)	0.850	11.7	0.010	1.5
College of St Scholastica (MN)	3.35	0.25	0.02	2.2
Dome Petroleum-Superior Terminal (WI)	2.69	0.386	0.011	6.9
St Mary's Medical Center (MN)	1.90	0.130	0.120	0.5
Bay Side Recycling Corp (MN)	0.080	1.18	0.02	3.4
ISD 2142 - Albrook High School (MN)	0.620	0.550	2.27	18.3
Qwest Communications - Duluth (MN)	0.500	0.010	0.00	0.2
IKONICS Corp (MN)	0.290	0.280	0.00	4.2
Altec HiLine LLC (MN)	0.210	0.090	0.010	2.3
Duluth International Airport (MN)	0.050	0.00	0.00	5.0
Cub Foods - Duluth (MN)	0.040	0.00	0.04	2.4
Miller Hill Super One Foods (MN)	0.040	0.00	0.00	3.7
Air Pollution from a Hypothetical Source: Natural Gas Fueled Electric Generator				
630 MW Combined Cycle Combustion Turbines	553	638	848	4.4

Sources: Minnesota Pollution Control Agency, Air Resource Specialists (May 2011, Table 2.1, lb/hr * 8760 hr/yr), and the Wisconsin DNRC. The "center" of Duluth is approximated as the intersection of N. 1st Ave. W. and E. 1st St.

Table 6
Air Pollution from a Large Electric Generator in West Duluth

Comparison of the largest emitters within 20 miles of Duluth	Pollutant (Tons per Year)		
	NOx	PM10	SO2
Hypothetical Large New Source	**553**	**638**	**848**
Graymont LLC. (WI)	526	98.3	657
Murphy Oil-Winter ST. Faclility (WI)	417	157	329
Duluth Steam Cooperative Association (MN)	383	27.4	403
Minnesota Power Inc - Hibbard (MN)	0.15	12.3	460
University of Minnesota - Duluth (MN)	0.00	158	0.00

Source: Mankato Energy Center LLC, Permit Number: 013000098-00. Appendix, Page 2 of 5, SV 001 and SV 002 combine, Minnesota Pollution Control Agency. WI data is from Wisconsin Division of Natural Resources Air Management Program.

Despite modeling a very large pollution source not far from the Fond du Lac Reservation's eastern boundary, Air Quality Specialists, Inc. concluded that *none* of the Class I PSD increment standards for particulate, NOx, and SO2 would be violated. Using very conservative assumptions, the PM-2.5 24-hour average would be half of the applicable increment while the annual average would be on 6 percent of the increment. For NOx the annual average would be about 2 percent of the increment. For SO2 the 3-hour and 24-hour averages would both be about 30 percent of the increment while the annual average would be about 4 percent of the increment.[49]

If a new pollution source significantly larger than the largest existing pollution sources in the Duluth-Superior urban area would not trigger violations of Class I air quality standards on the Fond du Lac Reservation, no likely industrial development in the Duluth-Superior area can be expected to be constrained by that Class I redesignation of the Reservation. We explain this conclusion in the sections that follow.

4. The Largest Employers in the Duluth-Superior Area

One way to put the traditional "smoke stack" industrial firms in perspective relative to the overall Duluth area economy is to look at the largest employers in the Duluth-Superior area. In 2010 the largest two-dozen employers in that area employed 24,400 workers.[50] None of those largest employers were traditional "smokestack" industries. Only one was a manufacturing firm, Cirrus Aircraft which produces aerospace products while employing 489 workers. It was 15th on the list of the largest employers.

[49] Ibid. Tables 4.1, 4.2, and 4.3.
[50] Northland Connection. This employment information is full-time equivalent jobs. http://www.northlandconnection.com/process.php?urlcalled=stlouis/duluth/industries.php .

Leading the list were health care firms which employed about 9,700 workers. Essentia Health was the largest of these firms, employing by itself 5,200 workers. Two more health care firms, St. Luke's and United Healthcare each employed about 1,400 workers. The remaining 1,600 health care workers in the top 24 firms worked in four other firms.

Four institutions of higher education were among the top 24 employers, providing over 3,000 jobs: University of Minnesota-Duluth, College of St. Scholastica, University of Wisconsin-Superior, and Lake Superior College. The Duluth and Superior K-12 public schools employed 2,200 people.

Public utilities (Allete's Minnesota Power [51]) and transportation (Burlington Northern Santa Fe, Great Lakes Transportation, and Halvor Lines) were the source of 3,000 jobs.

Non-educational local government employed 2,800 while the federal government employed 1,900.

Retailing (Walmart), food service and accommodations (Grandma's Restaurants), and finance (Wells Fargo) were also among the top 24 employers, providing among them, about 1,200 jobs.

Two of the largest six sources of air pollution in the Duluth area are also two of the largest employers in the area. The Hibbard Renewable Energy Center, operated by Minnesota Power, has a wood-fiber fueled electric generator that is the source of significant air emissions. However, only a tiny sliver of Minnesota Power's 1,500 employees in the Duluth area are employed at that facility. Most of Minnesota Power's employment in the Duluth area is associated with its administrative offices, maintaining the local transmission and distribution system, and providing customer service. Minnesota Power's main electric generating facilities are located far from Duluth.

The other large source of air pollution that is also one of the largest source of air pollution is the University of Minnesota-Duluth. As discussed above, it is the campus heating plants that are at the source of this pollution not the educational process itself. Providing heating, cooling, and, occasionally, back-up electricity for its 12,000 students and 1,700 full-time equivalent faculty and staff requires the equivalent of an energy utility serving a small city.

The list of the largest employers, however, makes clear that most employment in the Duluth urban area is not associated with heavily polluting industries. However, the concentration of people and economic activity in an urban area unavoidably also involves a concentration of the pollution associated with that population and its

[51] Allete's Minnesota Power is the local electric utility in Duluth. It operates only a small biomass fueled electric generating plant at the Hibbard Renewable Energy Center in the Duluth area. Its primary generation resources are located outside of the Duluth area. The Duluth area employment is associated primarily with the local transmission and distribution system, customer service, and administrative offices, not the operation of electric generating facilities.

activities. Those dispersed sources of air pollution, however, would not be governed by Class I air quality redesignation on the Fond du Lac Reservation.

5. The Evolution of the Duluth Area Economy Away from Dependence on Natural Resource Processing

Political and business leaders in the Duluth-Superior area have been emphasizing the transition the regional economy has been going through over the last several decades. The *Employment Review* published by the Minnesota Department of Employment and Economic Development recently described the Duluth economy in the following terms.[52]

> The development of the Prosperity Index was also an effort to give civic leaders a better picture of the strengths and challenges of the local economy. One thing that has been clear to city leaders is that the city is no longer as dependent on the traditional industries of northeast Minnesota like forestry, mining, and manufacturing. While tourism is one of the important industries, the growth of architecture, engineering, and computer system design firms has raised the annual payroll for professional and business services to more than double that for leisure and hospitality. In addition, the continuing growth of health care has meant that many of the traditional economic equations have changed. In 2008 health care and social assistance jobs were more than 27.9 percent of the total of all jobs in Duluth.

The City of Duluth's 2010 Comprehensive Annual Financial Report described the Duluth regional economy in the following terms:[53]

> Once dependent on heavy industry for its economic health, Duluth has diversified and is now a strong regional center for shipping, tourism, education, health care, retail sales, technology, architecture, engineering and aviation. …Duluth continues to excel in the key industry of tourism bringing approximately 3.5 million visitors to Duluth…According to survey results from the Minnesota Office of Tourism, visitors to Duluth contribute over $750 million to the local and regional economy….Enrollment at Duluth's three institutions of higher learning, the University of Minnesota-Duluth, the College of St. Scholastica and Lake Superior College, has never been higher.

The City of Duluth's 2006 *Comprehensive Plan* began with a reference to a "Vision Statement" contained in the *2001 and Beyond* community process that laid the basis for the development of the *Comprehensive Plan*:[54]

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[52] "Duluth's Prosperity Agenda, Drew Digby, February 2010, p. 3. http://www.positivelyminnesota.com/Data_Publications/Employment_Review_Magazine/February_2010/Duluth%27s_Prosperity_Agenda.aspx

[53] City of Duluth, Department of Finance, Comprehensive Annual Financial Report: City of Duluth, MN, FY Ended 12/31/2010, p. 2. http://www.duluthmn.gov/finance/2010%20Web%20CAFR.pdf

> Duluth's unique physical beauty and diverse cultural environment create our competitive advantage. Our people will work together, with respect for each other, to ensure that development is consistent with Duluth's future as an urban wilderness, as a neighborly and safe place to live, and as a place of high-skilled, high-wage employment.

In addition to this primary vision statement the vision guiding the 2006 Duluth *Comprehensive Plan* was broken into three primary guiding principles with additional definition and description:

> i. Preserving and Enhancing the Environment
> ii. Investing in People, Neighborhoods, and Community
> iii. Building a Strong Economic Base.

The *Comprehensive Plan* went on to discuss the Duluth "Economic Base—Where is Duluth Heading?"[55] It described the past, present, and future economic base of the Duluth area in the following way:

Over the last 50 years Duluth's economy has radically shifted from a heavy manufacturing and shipping-based economy to a diversified service-based economy. Manufacturing and shipping continue to play an important role as basic industries bringing in investment and export dollars. But the primary economic role that Duluth now plays in the region and the state is as a regional service center, with its medical and educational institutions providing the largest portion of jobs and local payroll. Tourism continues to grow as a basic industry, with Duluth's image increasingly being the gateway to the most popular outdoor recreation areas in the state.

The *Comprehensive Plan* emphasized the ongoing importance of the shipping industry to Duluth's future but recognized that Lake Superior could not be managed primarily as a shipping corridor if the environmental amenities associated with the Lake were going to continue to be a magnet drawing and holding residents and businesses. In addition the *Plan* pointed out that the "medical services sector is Duluth's largest sector as measured by jobs and payroll. As a regional provider of health care services, Duluth's medical sector businesses are poised to grow." In addition: "Duluth's higher educational institutions are an economic and cultural asset to the City. The universities and colleges have been expanding, both physically and in their enrollment." Finally, "Duluth's tourism and recreation sector businesses have dramatically expanded within the local economy over the last 20 years. These businesses contribute substantially to the City's budget, providing local revenue that ultimately supports City services."[56]

The focus of the *Comprehensive Plan* was not exclusively on older exports sectors and new service sectors. It also discussed the diversification of the Duluth area's

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[54] "Introduction," p. 3. http://www.duluthmn.gov/planning/comp_plan/
[55] Ibid. "Economic Profile," p. 18
[56] Ibid. p. 18-19.

manufacturing base: “Emerging industrial opportunities have been helping to diversify Duluth’s economy. Large companies such as the aerospace manufacturing firm Cirrus are in growth mode, and smaller companies can use Duluth’s well-educated and stable labor force to grow.[57]

6. Trends from the Past. Projections for the Future.

Census data on employment in the City of Duluth show the trends in employment discussed in general terms by the various reports cited above. Over the last two decades the primary sources of employment growth in Duluth has been found in the service sectors. Health Care, Educational Services, and Social Assistance were the leading source of jobs creation, adding 6,300 jobs, more than the total expansion of employment in Duluth between 1990-2010. It was also the only broad service sector that saw acceleration in job growth between 1990-2000 and 2000-2010. Arts, Entertainment, Recreation, Accommodations, and Restaurants were the source of 3,400 new jobs. Professional, Scientific, Management, and Administration employment grew by about 1,800 jobs. Finally the financial sectors added 720 jobs. The jobs created in these four broad services sectors have been two to four times the total jobs created in the overall economy. That is, the growth in service sector employment not only offset the loss of jobs in other sectors, but was the driving force supporting job growth throughout the Duluth economy. See Table 7 below.

Table 7

Sources of Employment Growth in Duluth, MN 1990-2010

Sectors of the Economy	Increases in Employment, Duluth City, MN		
	1990-2000	2000-2010	1990-2010
Health Care, Educational Services, Social Assistance	2,852	3,472	6,324
Professional, Scientific, Management & Administration	970	786	1,756
Arts, Entertainment, Recreation, Accomodations, Restaurants	3,131	236	3,367
Finance, Insurance, and Real Estate	531	189	720
Total Increase in Duluth Employment	4,687	1,284	5,971
% of Total Employment Gains from These Four Services Sectors	160%	365%	204%

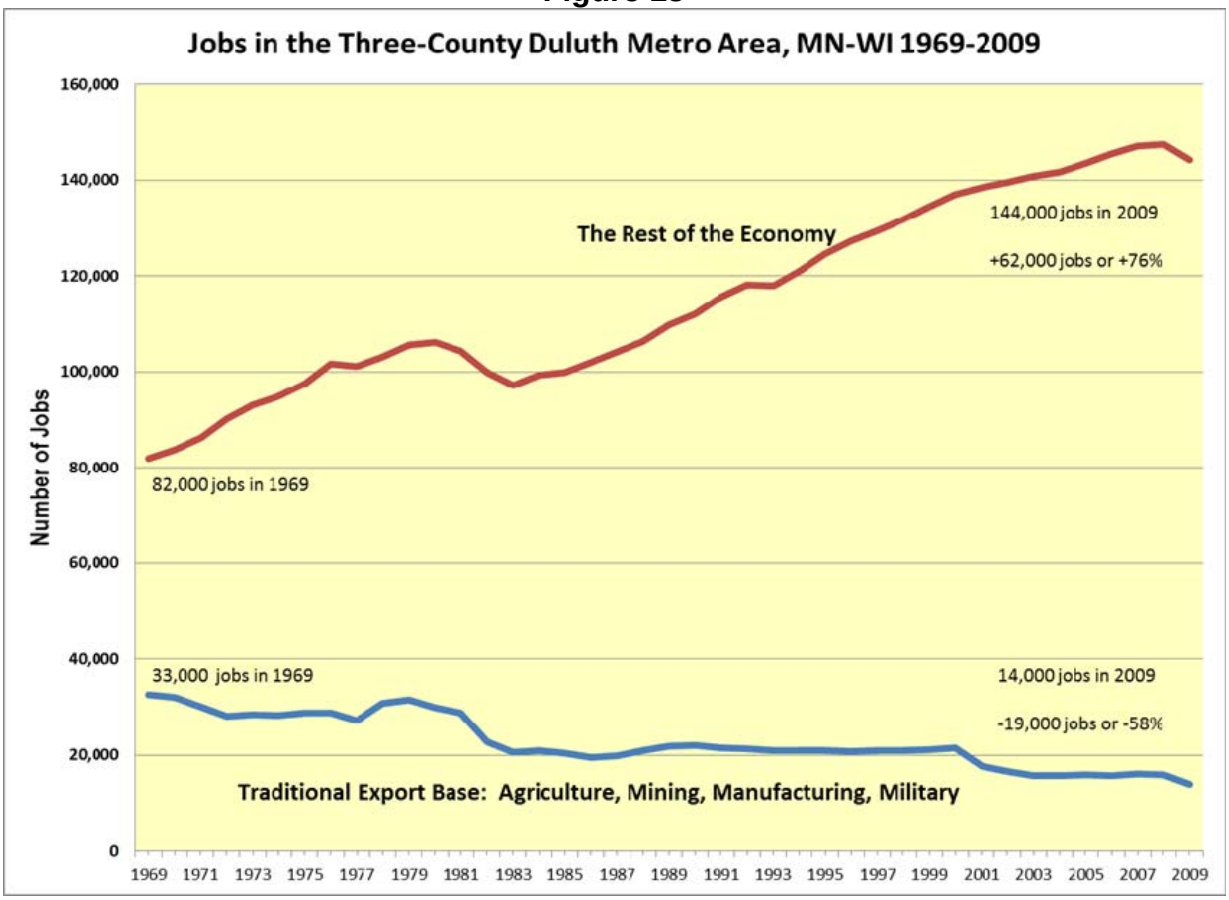
Source: U.S. Census Bureau, American Fact Finder, Table DP03, Selected Economic Characteristics, Employment Status by Industry.

The trends in the larger regional economy surrounding the Duluth-Superior urban area, including all of St. Louis, Douglas, and Carlton Counties, which together make up the Duluth-Superior Metropolitan Statistical Area, show the divergent trends in the service sectors and traditional export sectors: manufacturing, mining, agriculture, and U.S. military bases. While over the last 40 years, employment in those traditional export sectors declined by almost 60 percent, the rest of the Duluth-Superior economy did not follow that trend. Instead the rest of the economy, led by expansion in the professional service sectors, expanded by 76 percent, adding 144,000 jobs. That job growth offset

[57] Ibid.

the 19,000 jobs lost in the traditional export sectors by a factor of almost 8 to 1. Clearly the Duluth regional economy successfully underwent a major transformation away from primary reliance on natural resource based export activities. See Figure 13 below.[58]

Figure 13



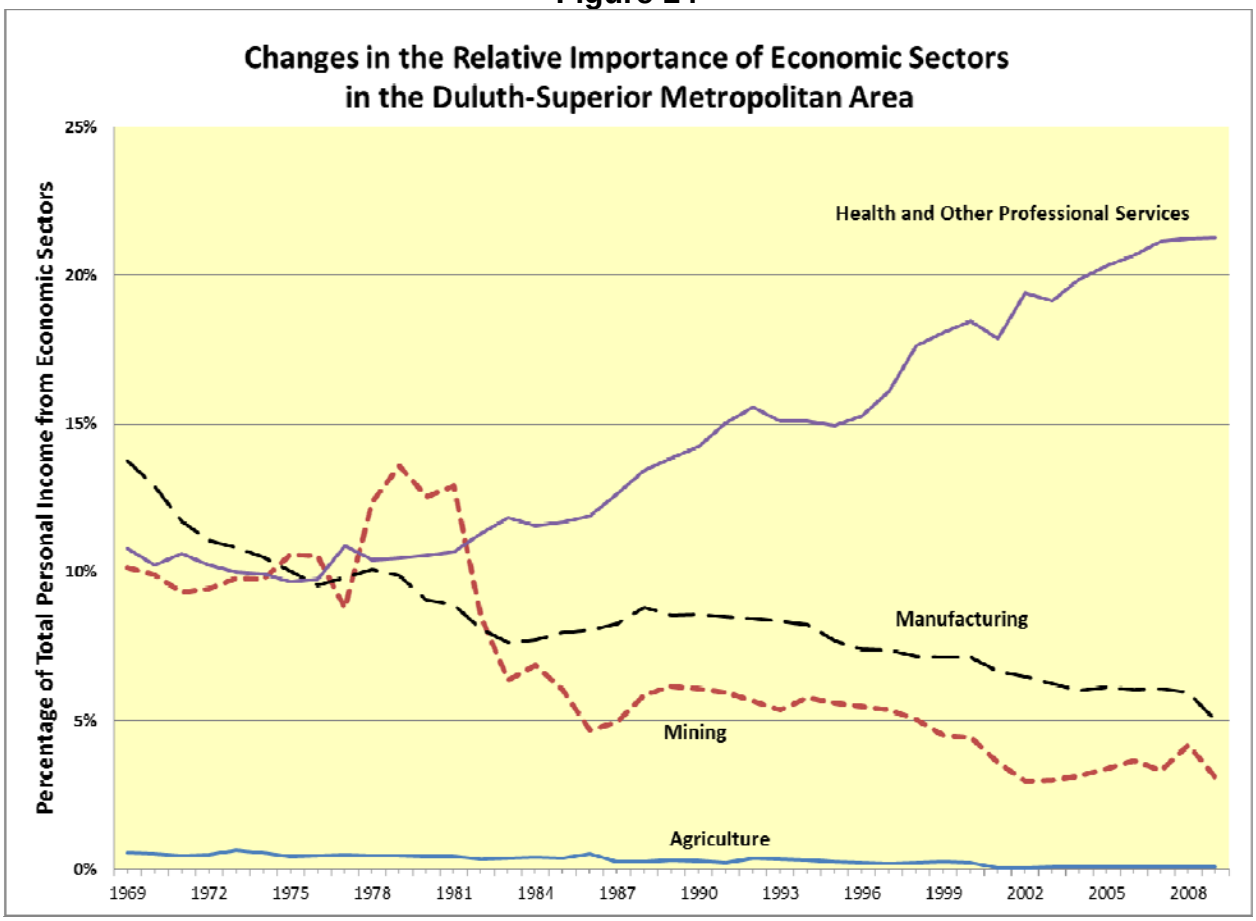
The dramatically different trends that different sectors of the Duluth-Superior economy have been on can be seen by looking at the trends in the sources of personal income from manufacturing, mining, and agriculture over the last forty years and comparing it to the trends in health and other professional services. Manufacturing payrolls as a source of personal income have declined from about 15 percent to about 5 percent. Mining's payroll as a source of income has declined from 10 percent to about 4 percent. Agriculture's contribution has always been very low and got even lower. Meanwhile professional services' contribution to personal income has increased from about 10 percent to 22 percent. See Figure 14 below.

It will be noted that the sectors that we have explicitly mentioned above represent less than a third of total personal income. This is partly because wages and salaries represent less than 58 percent of total personal income. Personal income also flows to

[58] Both of the next two figures are based on U.S. Department of Commerce, Bureau of Economic Affairs, Regional Economic Information System data on employment and personal income by industry.

households from investment income: dividends, interest, and rent. In addition households receive income from the federal government as retirement benefits (e.g. Social Security and Medicare reimbursements), income support payments (e.g. unemployment compensation, Medicaid, food stamps, etc.). These income flows to households in 2009 to the Duluth metro area represented over 42 percent of personal income. These are not income flows associated with payrolls in any industry. In our discussion above we also ignored several important sectors of the economy that, while fluctuating over the last four decades, have not had a significant upward or downward trend to them. These include retail trade, construction, utilities, and transportation.

Figure 14



These past trends in employment in the various industrial sectors are not expected to change in the near term. Projections of economic growth for the larger "Northland" region, a 17 county area of northeastern Minnesota and northwestern Wisconsin for which the Duluth-Superior metro area is the primary trade center, show agriculture, forestry, mining, and manufacturing employment continuing the slow downward trend that characterized the regional economy in the four decades before the sharp drop in

economic activity associated with the "Great Recession."[59] By the middle of the current decade, 2015, employment in each of these sectors will still be below its level in 2002. Relative to the pre-recession levels (2007), employment in those sectors will also be down except for mining which is projected to employ slightly more workers (200) in the middle of the decade compared to 2007 employment levels.

In health care services, professional and technical services, and accommodations and food service, employment is projected to face continued growth so that employment in the middle of the current decade in those sectors will be well above the levels of 2002 and 2007. The Information Services sector is projected to have employment levels in the middle of the decade about the same as in 2002 and 2007.

It is because of these long-run trends and projections for the near term that we do not expect significant expansion in the Duluth urban area in industrial sectors area that are associated with high levels of air pollution. As pointed out above, it would take a facility that produces air pollution levels as much as two to four times the largest existing sources of air pollution in the Duluth urban area to violate Class I air quality increments on the Fond du Lac Reservation. Such heavily polluting industrial sectors have been in decline and/or they have been able to modify their production technologies to dramatically reduce their levels of pollution. In addition, given Duluth's focus on protecting environmental quality and quality of life in the Duluth area as a central part of its competitive economic development strategy, it is not clear that Duluth would welcome such a new, very heavily polluting, industrial operation.

V. Conclusions

The conceptual and empirical analysis above supports the following conclusion with respect to the economic impact of the Fond du Lac Reservation being redesignated as a Class I air quality area.

1. **A half-century of research has demonstrated that protecting and improving air quality protects health, reduces premature death, increases worker productivity, enhanced local quality of life, boosts local property values, and otherwise enhances local economic well-being as well as local economic vitality.**

Air quality is not primarily a matter of aesthetics although it is that too. Air pollution has serious health consequence that lead to chronic illness and premature death. It keeps students out of school and workers absent from work. It degrades water quality and impacts natural systems threatening wildlife and outdoor recreation activities. It damages infrastructure, equipment, and buildings increasing maintenance costs and decreasing the working life of property. Ordinary citizens act to avoid higher levels of air

[59] "The Economic Structure of the Northland Works Region, 2009," Bureau of Business and Economic Research, University of Minnesota-Duluth, June 2009.

pollution by avoiding areas with higher levels of pollution, driving property values down in those areas and depressing local economic vitality.

2. The available evidence indicates that Class I air quality designation and other efforts to protect and enhance air quality, while improving local health and economic well-being, do not damage local economic vitality.

The Clean Air Act imposed Class I air quality status on many local areas around the nation, namely those areas with National Parks and National Wilderness Areas. These natural landscapes, of course, also have many more environmental restriction placed on their use and management in order to protect their natural qualities indefinitely into the future. There is no evidence that these more stringent air quality regulations reduced local economic vitality in the surrounding areas, quite the contrary. National Park and Wilderness counties demonstrate above average economic vitality. Studies of the application of the Clean Air Act to move local areas into compliance with air quality standards also do not suggest that such areas' economic vitality has been retarded or damaged by the air quality restrictions and improvements in local air quality. The permitting of the expansion of metal mining and processing in northeast Minnesota in relatively close proximity to two Class I air quality areas, the Boundary Waters Canoe Wilderness Area and Voyageurs National Park, is evidence that significant economic development, even heavy industrial development, can take place in relatively close proximity of Class I air quality areas if proper pollution control mitigation steps are taken.

3. Structural change in the Fond du Lac Reservation area economy has decreased the likelihood that Class I air quality redesignation would limit economic development in the Reservation area.

The analysis in this report has documented a major shift in the structure of the economy in which the Fond du Lac Reservation is embedded. Paper, wood products, logging, and other manufacturing jobs were cut in half while the overall economy grew significantly. As a result, those manufacturing jobs fell from providing 36 percent of all jobs to providing about 9 percent of jobs. That is, the relative importance of paper, wood products, logging, and other manufacturing fell to a quarter of what it previously had been. Manufacturing real payrolls fell to a third of what they had been forty years earlier. The trend in the relative importance of manufacturing in the Carlton County economy has been steadily downward for over four decades.

Given this 40-year decline in manufacturing activity in the area immediately adjacent to the Fond du Lac Reservation, it is highly unlikely that Class I redesignation of the Reservation would constrain manufacturing activity in Carlton County. That redesignation *could* limit significant increases in air pollution from individual manufacturing firms in areas adjacent to the Reservation. Significant expansions at the paper and wood products facilities, however, would likely involve the deployment of new technologies that would be less pollution intensive than existing operations. For that reason, it is unlikely that the limited Class I increments available under Class I

Reservation status would hinder such expansions. Given that the 40-year trend in paper, wood products, and other manufacturing not only in Carlton County but also nationwide has been downward, not upward, Reservation Class I redesignation is highly unlikely to limit manufacturing activities in Carlton County.

Air quality modeling of the addition of very large industrial facilities both east of the Reservation in the Duluth-Superior area and northwest of the Reservation in the Grand Rapids, MN, area has also indicated that such developments would not violate Class I prevention of significant deterioration limits on the Reservation.[60] The industrial facilities modeled were quite large electric generation plants, far in excess of what any Minnesota utilities have proposed building in the near future. The large electric generation plants whose air pollution was modeled at least partially serve as a representation of what impacts other large industrial facilities at some distance from the Reservation might have on air quality on the Reservation. That modeling indicated that such industrial facilities would not add increments of pollution that exceeded the Class I limits on the Reservation.

4. That same economic transformation of the Reservation area economy has also increased the value of clean air to local economic vitality while decreasing the likelihood that those higher air quality standards would constrain local economic vitality.

The ongoing economic vitality in the Fond du Lac Reservation area has been lead by the expansion of economic activities with relatively low air pollution: local government, professional and technical services including health services, resorts and other visitor services, etc. Local economic vitality has also been supported by families that have chosen to live in Carlton County while working elsewhere, including in the Duluth-Superior areas. Carlton County has been attracting both working-age and retirement-age in-migrants, drawn to the area by its social and natural amenities. A high quality environment also encourages visitors to travel to Carlton County for recreation purposes. Protecting and enhancing air quality improves the area's quality of life and its attractiveness as a place to live, visit, and engage in economic activity. In that sense protecting air quality in the Reservation area, assists economic development efforts.

5. Class I air quality redesignation on the Fond du Lac Reservation will not constrain economic development in the Duluth-Superior urban area.

Previous air quality modeling done in support of the Fond du Lac Band's proposed Class I air quality designation has demonstrated that a very large air pollution source located in West Duluth would not violate the Class I air quality increments on the Reservation. The industrial facility modeled, a very large electric generating plant, would emit more of various pollutants relevant to Class I air quality than those coming from the largest existing emitter in the Duluth-Superior area. Compared to other large existing emitters whose rank is just below the top, that air quality modeling assumed a new

[60] "Energy Impact Analysis in Support of Class I Redesignation Requests," Air Resource Specialists, Inc., prepared for the Fond du Lac Band of Lake Superior Chippewa.

facility with much higher levels of pollution. Such a new large polluting industrial facility is unlikely to be built in the Duluth-Superior area.

The Duluth-Superior urban area has significantly diversified its economy away from primary reliance on the natural resource and heavy industrial processes that in earlier decades made up its industrial base. Those heavily polluting industrial sectors have been in decline in the region for several decades. The Duluth-Superior economic base is increasingly tied to professional and technical services, including health services, institutions of higher education, regional trade center functions, and a growing visitor economy. A different type of relatively high-tech manufacturing, such as aero-space equipment, has also been developing. Individual new facilities associated with these growing sectors of the Duluth-Superior urban economy will not produce air pollution in volumes sufficient to threaten the air quality increments associated with Class I status on the Reservation.

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