# COMPREHENSIVE PLANS
# FOR THE
# SOUTHWEST & SOUTH CENTRAL
# PLANNING DISTRICTS OF
# SKAGIT COUNTY
# WASHINGTON

JUNE 1979

SKAGIT COUNTY PLANNING DEPARTMENT
218 COUNTY ADMINISTRATION BUILDING
MOUNT VERNON, WASHINGTON 98273

JULY 1979

# COMPREHENSIVE PLAN FOR THE SOUTHWEST DISTRICT AND SOUTH CENTRAL DISTRICT OF SKAGIT COUNTY, WASHINGTON


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## 0.3 PREFACE

Chapter 172, 1st Extraordinary Session, Laws of 1973 amended RCW 36.70.320 (known as the planning Enabling Act) to allow Comprehensive Planning on a District or less than entire county basis.

The Skagit County Planning Department has adopted the District approach to Comprehensive Planning to facilitate the preparation and adoption current, viable plans specifically tailored to the needs and objectives of each of the several separate and distinct geographical areas of the county.

The six Planning Districts selected for Skagit County are generally identified as follows:

North Central District - including the area surrounding Sedro Woolley.
Northwest District - including the area surrounding Burlington.
Island District - including the area surrounding Anacortes.
Southwest District - including the area surrounding La Conner.
South Central District - including the area surrounding Mount Vernon.
Upriver District - including the area surrounding Concrete.

The Southwest and South Central Planning Districts are fourth and fifth in a series of six areas that are under revision for a new Comprehensive Plan for Skagit County. The Comprehensive Plan for the County, combining the six different districts, is scheduled for completed in 1979.

It should also be noted that Chapter 172, 1st Extraordinary Session, Laws of 1973, which amended the Planning Enabling Act as mentioned above, does not invalidate previous Comprehensive Plans or those portions of previous Comprehensive Plans covering areas other than the Planning District. Since there are a number of areas which can best be considered on the basis of a county-wide plan, the District Plan should be considered to be a supplement to the County-wide Comprehensive Plan adopted in 1968. In areas wherein there is an apparent conflict, the District Plan takes precedence. When all six districts plans are completed, the new Comprehensive Plan will be considered complete and the 1968 Plan will then be superseded in its entirety.

## 0.5 SUMMARY - SOUTHWEST & SOUTH CENTRAL AREA COMPREHENSIVE PLANS

The Southwest and South Central Comprehensive Plans described and evaluated in this document are important milestones in Skagit County's planning program. These plans represent a culmination of several year's effort to update and revise the Comprehensive Plan for Skagit County. The plans for the Southwest and South Central areas are fourth and fifth in a series of revisions of Skagit County's Comprehensive Plan.

However, these plans for the Southwest and South Central areas do not represent a completion of the planning process for these areas. These plans will and should be amended and revised as community standards change. No comprehensive plan should be considered as the final answer to all land use problems and decisions. It can be a valuable and usuable guideline through which decisions related to land use can be made. As with any guideline, these plans should be used regularly by decision makers in order to reap the best benefits a comprehensive plan can provide.

The recommendations contained in this plan can best be described by the following generalization:

1. The existing and future agricultural use of the floodplain should be provided with at least 20 year flood frequency protection.
2. The variety of lifestyles available in the Southwest and South Central area, both rural and urban, should be maintained or expanded in those areas where the physical environment and existing developments are compatible.
3. Development of the unprotected floodplain area should be stopped.
4. New development should be directed to floodsafe uplands of the Southwest and South Central areas.
5. Commercial goods and services should be provided by the traditional urban centers. Highway services only should be provided at key arterial intersections.
6. Industrial uses should be located near urban centers or in areas where the physical environment and existing or proposed land uses are conducive and compatible with the proposed industrial development.

## 0.6 SUMMARY SHEET - SOUTHWEST AND SOUTH CENTRAL E.I.S.

Nature of this report: Draft Environmental Impact Statement

Sponsor: Skagit County Planning Department
Room 218, County Administration Building
Mount Vernon, Washington 98273

Type of Proposed Action: Legislation

Official Title of Proposed Action and Summary of the Proposed Action:

Southwest and South Central Districts - Skagit County Comprehensive Plan Amendment.

The proposed legislative action will amend and revise portions of the current and official Skagit County Comprehensive Plan. The portions for which the comprehensive plan are being amended are generally described as:

Southwest District: Boundaries:

North - from the Swinomish Bridge easterly along Highway 20 to the intersection with north - south center line of Section 11, Township 34N, Range 3 East;

East - south on the center line of Section 11, Township 34 N, Range 3 East, then south to the center of Section 23, Township 34, Range 3, then east to Penn Road, then South to the center of Section 25, Township 34, Range 3, then east to the center of the Skagit River, then south following the South Fork of the Skagit (via Tom Moore Slough) to the confluence with Skagit Bay;

South - Skagit County Line;

West - from the Swinomish Channel bridge, south along the center of the Swinomish Channel to the Skagit County line (east of Ika Island);

This area contains approximately 41.5 square land miles, all within Skagit County (excluding theTown of La Conner).

environment either beneficially or detrimentally. However, each specific development, or each consumption of land, at the project level, is the point in time or source at which environmental assessments and impact statements should be developed, issued, reviewed, and commented upon.

Comprehensive Plans are not rigid, fixed documents, but developed with references to the various standards of a neighborhood, community, or region to guide the development of the areas, so as to provide an identifiable lifestyle of the areas, against which various forms of land development or use may be analyzed and evaluated. A Comprehensive Plan can and should change as community standards and goals change.

A list of environmental impacts of a Comprehensive Plan would include all of the aspects of that plan both in terms of all of the myriad types of activities it would condone for finite areas and all of the larger group of activities that would be precluded in finite areas.

The Comprehensive Plan will:

1. Allow substantial development of large land area for the following use activities:

    a. residential
    b. commercial
    c. industrial
    d. public
    e. agricultural
    f. forestry

2. Prevent many types of development and land use activities.
3. Provide minimum standards for development and land use activities.
4. Allow habitat change for numerous indigenous species of flora and fauna.

Summary of Alternatives

A. No Comprehensive Plan

Comprehensive Plans are required by the Revised Code of

## 0.4 FOREWARD

The Southwest and South Central District Plans contained in this volume and illustrated in principle on the accompanying maps are the fourth and fifth in a series of six District Comprehensive Plans stemming from the Comprehensive Land Use Planning Alternatives Program completed in 1973.

This series of six District Plans, when completed, will form an entirely new Comprehensive Plan for Skagit County.

These Comprehensive Plans will produce a pattern of development for the Southwest and South Central areas of Skagit County that will: 1) preserve the resource productive areas; 2) provide a variety of living environments; and 3) maintain control over the costs associated with community growth and improvement.

South Central District: Boundaries:

North - SR 20 at Avon-Allen Road east along the northern section line of Section 12, Township 34, Range 3, to Pulver Road south on Pulver Road to the center of the Skagit River, then e-st via the center of the Skagit River to the western section line of Section 22, Township 35, Range 6;

East - south along the western section line of Section 22 Township 35, Rang e 6, to the southwest corner of Section 36, Township 34, Range 6, then south along the section line between Ranges 6 and 7 to the Skagit County line;

South - Skagit County line;

West - Center of Section 11, Township 34, Range 3 and the intersection of SR 20, south along the center section line to the center of Section 23, Township 34, Range 3, then east to the center of Section 24, Township 34, Range 3, then south to the center of Section 25, Township 34, Range 3, then east to the center of the Skagit River, then south following the South Fork of the Skagit (via Tom Moore Slouth) to Skagit Bay.

This area contains approximately 190.5 square land miles all within Skagit County (excluding the City of Mount Vernon).

Summary of Environmental Impacts:

A Comprehensive Plan, by its nature, is a permissive document in terms of potentially allowing a wide variety of land uses to occur. It is also restrictive in that adherence to the provisions, policies, and goals of a Comprehensive Plan will prelude a variety of land uses from occuring. Thus, there is a balance of the liabilities and benefits of a Comprehensive Plan.

No Comprehensive Plan will have a direct environmental impact. A Comprehensive Plan does not develop projects, or prohibit or promote, degradation of the environment directly. The various provisions and policies of a Comprehensive Plan will, upon implementation, affect the

Washington, thus this alternative would require a change in state law which is beyond the range of control of the Board of County Commissioners.

B. More Proscriptive Comprehensive Plans

More proscriptive Comprehensive Plans could at an extreme preclude all forms of development and land use activities and could propose that as existing development and land use activities are amortized that the area they occupy be returned, or allowed to return to its natural status.

C. More Liberal Comprehensive Plans

More liberal Comprehensive Plans could allow any form of development to occur in any area, adjacent to any other development or undeveloped area, in which any form or degradation or alteration of existing systems would be allowed.

D. For discussion of the alternatives for the Southwest and South Central Districts refer to Chapter 4 in the plan.

3. Recommended Plans

A. For a discussion of the recommended plan for the Southwest District refer to Chapter 6. For a discussion of the South Central District plan refer to Chapter 7.

B. For a graphic representation of the Southwest and South Central Area Comprehensive Plans see attached maps.

Review Period: 35 days (Comment Period deadline is

Recipients of the E.I.S. Document:

1) Skagit County Board of Commissioners
2) Skagit County Planning Commissioners
3) Skagit Regional Planning Council
4) City of Mount Vernon
5) Town of La Conner
6) Regular E.I.S. Distribution List

## 0.7 LIST OF DOCUMENTS

1. Comprehensive Plan - Skagit County, January 1968.
2. Comprehensive Land Use Planning Alternatives for the Skagit River Floodplain and Related Uplands, Skagit Regional Planning Council, April, 1973.
3. Skagit County Water, Sewerage, and Drainage Facilities Plan, Skagit Regional Planning Council, June 1970.
4. Skagit County - A Strategy for Environmental Protection and Economic Development, The Urban Land Institute, November, 1972.
5. Skagit County Agriculture: An Economic Mainstay, Department of Agriculture, Washington State University, 1972.
6. A Tourist and Recreation Strategy for Skagit County, Northwest American, 1972.
7. The North Cascades Highway, Its Impact on Local Community Economics, Community Development Services, 1972.
8. Puget Sound and Adjacent Waters Study, Pacific Northwest River Basins Commission, 1970.
9. Soil Survey - Skagit County Washington, U.S. Department of Agriculture, Soil Conservation Service, January 1960.
10. Solid Waste Management Plan, Skagit County Planning Department, 1971.
11. North Puget Sound Region for 1971, A New Plan for Law and Justice, Northwest Regional Council.
12. Overall Economic Development Plan (Skagit County Washington). Skagit County Development Association, 1972.
13. Skagit County Emergency Services Operations Plan, Skagit County Department of Emergency Services, October 1972.
14. Skagit County Comprehensive Park and Recreation Plan, Jongejan, Gerrard, Associates, 1973.
15. Skagit County Industrial Site Survey, Latourell Associates, 1972.
16. Skagit County Water Quality Management Program, CH2M/HILL, 1974.
17. Swinomish Comprehensive Plan, Stevens, Thompson, Runyan, 1972.

## 0.8 PREAMBLE FOR THE SKAGIT COUNTY COMPREHENSIVE PLAN

On September 10, 1968, the Skagit County Board of County Commissioners adopted a revision of its Comprehensive Plan which stated as follows:

> "This text together with the Comprehensive Plan-Map, the 'Analysis of Population in Skagit County,' the 'Skagit County Economic Base,' October, 1964, 'Parks and Recreation,' a Plan for Skagit County, comprises the Comprehensive Plan for Skagit County."

Chapter II, entitled "Purposes and Intent" of the Comprehensive Plan on Page 9 explained the intent of Skagit County as follows:

> "This Plan should be periodically reviewed by the Planning Commission and said Board. In addition to adding more detailed plans, it may be necessary from time to time to change basic features of the Plan, as economic, social or technological changes indicate a better basic pattern of land use or a need for re-evaluation of planning principles and objectives."

The Washington State Planning Enabling Act, RCW 26.70.340 provides that:

> "When the Comprehensive Plan containing the mandatory subjects as set forth in RCW 36.70.330 shall have been approved by motion by the Board and certified, it may thereafter be progressively amplified and augmented in scope by expanding and increasing the general provisions and proposals for all or any one of the required elements set forth in RCW 36.70.330 and by adding provisions and proposals for the optional elements as set forth in RCW 36.70.350. The Comprehensive Plan may also be amplified and augmented in scope by progressively including more completely planned areas consisting of natural homogeneous communities, distinctive geographic areas, or other types of districts having unified interests within the total area of the county . . . "

Skagit County recognizes that its Comprehensive Plan must be studied continually and revised whenever new technology, techniques and other data indicate that the best interest of the County, or any portion thereof, will be served thereby.

Skagit County recognizes, as it moves forward from its long range generalized plan adopted in 1965 and amended in 1968, to more precise plans for development, that because of the vast amounts of land within the boundaries of Skagit County (1,735 square miles), and because of the great diversity of the kinds of land and needs of its citizenry, and in order to make the Comprehensive Plan more meaningful as a guide and a tool for the regulation of land, it is in the best interest of the people of Skagit County to supplement the plan by dividing the county into natural homogeneous communities and geographic areas in order that more precise development policies can be developed and adopted for the more natural homogeneous communities and geographic areas.

Therefore, Skagit County, for planning purposes, is divided into the following districts:

1) North Central
2) Upriver
3) South Central
4) Southwest
5) Northwest
6) Island

and, in conjunction with the revision and updating of the general provisions that apply to the county as a whole, more precise plans and guidelines that will apply more particularly to the specific areas will be developed for these areas or districts.

The following describes the approximate boundaries of the six planning areas of Skagit County:

1) North Central

North - Skagit County Line
South - Skagit River
West - A line running north from the Skagit River along the District Line Road to the Cook Road, then west along the Cook Road to Highway I-5, then north along I-5 to the County Line.

East - A line running north from the Skagit River beginning at a point lying between Sections 21 and 22, Range 6, Township 35, and continuing north to the County line (generally between Lyman and Hamilton)

2) Upriver:

North - Skagit County Line
South - Skagit County Line
West - A line running between county lines, parallel to a north/south line between Section 21 and 22, Range 6, Township 35 (generally between Lyman and Hamilton).
East - Skagit County Line

3) South Central:

North - Skagit River
South - Skagit County Line
West - South along the Skagit River from its intersection with I-5.
East - A line running south from the Skagit River beginning at a point lying between Section 21 and 22, Range 6, Township 35, (generally between Lyman and Hamilton).

4) Southwest:

North - A line running west beginning at a point between Section 12 and 13, Range 3, Township 34, generally south of Avon.
South - Skagit County Line
West - The center of the Swinomish Channel
East - South along the Skagit River from ins intersection with I-5.

5) Northwest:

North - Skagit County Line
South - Skagit River, to a line running North along the Polver Road to a line running west beginning at a point between Sections 12 and 13, Range 3, Township 34, (generally south of Avon).

West - The center of the Swinomish Channel.

East - A line running north from the Skagit River along the District Line Road to the Cook Road, then west along the Cook Road to Highway I-5, then north along I-5 to the County Line.

6) Island:

All of the islands of Skagit County lying west of the center of the Swinomish Channel.

NOTE: The Island Planning District does not include the city of Anacortes.

(See "Scope," Page 8, 1968 Skagit County Plan)

The text portion of the Comprehensive Plan, including the illustrative materials, tables, and charts, is designated as the "plan policies." It sets forth in narrative form the public objectives, policies and standards to be applied when guiding the future growth of Skagit County.

In addition to the plan policies there is also a map portion of the Comprehensive Plan which is designed and intended to illustrate the application of the plan policies in a general way.

The Comprehensive Plan is an expression of the public policy outlining the general guidelines for the future development of the county and is not designed or intended to establish precise land use boundaries in either the policies or the map portion of the plan.

# 1. PHYSICAL ENVIRONMENT

The physical environment is a complex of many interrelated elements. Often times action upon one seemingly isolated element has subsequent impacts upon other elements. It is important therefore, to know the elements and their relationships with other elements, including man. The physical characteristics section is composed of the following sections:

1.1) Geology
1.2) Slope
1.3) Soils
1.4) Septic Suitability
1.5) Floodplain
1.6) Coastal Shoreline Characteristics and Processes
1.7) Hydrology

The diverse physical environment can be mapped and discussed for specific areas, such as the Southwest and Southcentral Planning areas. The value of an analysis of the Physical Environment is that those responsible for planning decisions can more clearly understand the relationship between the characteristics of the land and the effects that development will have upon the other elements of the environment.

## 1.1 GEOLOGY

The study area consists of two general geologic regions. The western part is in the Puget Sound Trough of the Pacific Border Province, which consists mainly of the extensive delta and floodplain of the Skagit River, alluvial flats, glacial outwash plains, and a few lateral or frontal moraines. The elevation of these lowlands ranges from sea level to approximately 400 feet, with the exception of a few areas which are higher.

Most of Skagit County lies in the Northern Cascades region of the Sierra-Cascade Province. The Cascade Mountains consist of ancient sediments, strongly folded, generally metamorphosed, and intruded by granite batholiths. The summit elevation of this mountainous region ranges from 6,000 to 8,000 feet, with some peaks rising even higher. Glaciation has left its mark, characterized by the extreme ruggedness of much of this area. The forces of glaciation and heavy annual snowfall still have a great influence especially in the high elevation above 5,000 feet.

The Skagit River, which is the second largest river in the state, is the backbone of much of the study area. Its system drains much of the county, with the main tributaries being the Sauk, Cascade, Suiattle, and Baker Rivers.

### 1.1.1 GEOLOGIC UNITS

The geology of the study area is characterized by four dominant forms, and five other forms of more localized importance. The dominant forms are:

- Alluvium (Qa)
- Paleocene-cretaceous non-marine rocks (Tkc)
- Undivided glacial drift (Qg)
- Undivided pre-tertiary sedimentary and unsedimentary rocks (PT).

The smaller, more local forms are:

- Undivided sedimentary and cretaceous rocks (Jk)
- Glacial till (QgLT)
- Non-marine oligocene rocks (Oc)
- Outwash stratified drift and associated material (Qgl0)
- Metamorphic rocks of low-grade zone (Pjph).

### 1.1.2 GEOLOGY MAP

The geology map locates these geologic units in the planning area on a generalized basis. Refer to Geology Map, Map A, Comprehensive Land Use Planning Alternatives Study.

### 1.1.3 SUB-AREA ANALYSIS

#### 1.1.3.1 SOUTH SKAGIT FLOODPLAIN

This section of the floodplain is influenced greatly by the Skagit River and the previous scouring effects of the Pleistocene Glaciation. It consists mainly of Alluvium (Qa). This material is mostly unconsolidated silt and gravel valley fill with some clay. It also includes low-level terrace, marsh, peat, artificial fill, and glacial deposits. This alluvium is a product of post-glacial stream erosion and deposition. The Skagit River, starting in the Cascades, emerges onto the lowlands where it discharges its load of silt and sand. As the river drops its sediment, deltas are built seaward, gradually extending the land westward as portions of the troughs are filled with silt and sand. The Skagit River has been building its large delta and floodplain westward for the past 10,000 years.

There is an exception to this generally flat alluvium floodplain in the Pleasant Ridge/LaConner/Fish Town Area. Where the advancing front of the Skagit Delta encountered islands such as this, they were surrounded by sediments and are now seen as hills rising above the flat floodplain.

The Pleasant Ridge area is composed of younger glacial drift (Qglt). This consists of till, a hard blue-gray to gray concrete-like mixture of clay, silt, sand, and gravel which was deposited at the end of a recessional moraine. It is principally Wisconsin in age.

The LaConner area, although very close to Pleasant Ridge, is somewhat different in its geologic composition. The area consists of upper jurassic-lower cretaceous sedimentary and volcanic rocks (JK). More specifically, these are sedimentary and volcanic rocks that are undivided. Some of these include graywacke, argillite, siltstone, slate, volcanic rocks, phyllite, greenschist, and greenstone. It is reasonable to believe that this area underwent some uplifting before the Pleistocene Glaciation, between the Jurassic and Cretaceous periods.

The Fish Town area is composed of Oligocene non-marine rocks (Oc). These consist of andesite conglomerate, tuff beds, and mud-flow material.

1.1.3.2 SOUTH CENTRAL AREA

The western part of this area, including the western part of the City of Mount Vernon, is influenced by the Skagit River. West of Mount Vernon the Skagit opens into its wide expansive floodplain. Obviously, alluvium (Qa) is the prominent understructure here.

The hills in the eastern section of the city and around Conway consists of younger glacial drift (Qgl). The understructure and their fairly gentle slopes are products of the glaciation. Between these two areas, however, lies a group of much more resistant hills. This area includes Little Mountain and Devils Mountain which consists of pre-tertiary sedimentary and metasedimentary rocks (PT), and paleocenecretaceous non-marine rocks (TKC). This same formation runs eastward to include the area around Big Lake, Devils Lake, and Lake McMurray. These lakes are probably all glacial in origin.

The Walker Valley is an example of a glaciated valley, the west side of which contains pre-tertiary sedimentary and metasedimentary rocks (PT), while the east side is mostly younger glacial drift (Qgl).

#### 1.1.3.3 MIDDLE SKAGIT RIVER AREA

The Skagit River meanders through the Middle Skagit Area constantly using its natural forces to change the form of the land. This is done by deposition, erosion, and flooding. This area of the river has a multitude of bends, some of which are near towns. During enlargement of a bend, the river channel shifts toward the outer part of the bend, leaving a strip of relatively flat land, or floodplain, on the inner side of the bend. The floodplain is built of bars composed largely of sand and gravel brought as bed load scoured from the outsides of bends immediately upriver. Inundation of the floodplain from time to time allows finer silt and clay to settle out over the surface, adding to the floodplain height and covering the coarser alluvium beneath. As lateral cutting by the river continues, the floodplain strips grow wider and presently join to form continuous belts along either side of the river. The cutting and filling proceeds to such an extent that the channel migrates here and there across the entire floodplain.

### 1.1.4 PLANNING IMPLICATIONS

These geological considerations have a great effect not only on the density of development, but also on the configuration of that development to the land itself. Ground configuration and substratum determine how both buildings and services (water, sewer, roads, etc.) are dispersed over the land. Historically, flat areas, such as valley and river basins, have been very susceptible to a grid pattern of development. This makes it easy to administer the land and to provide the necessary services, but all too often the resulting development has been regarded as monotonous, ugly, and depressing. The existence of a variety of landforms and resources in an area provides a natural base with which to plan a development pattern that enhances these attributes instead of ignoring them. The upland areas of Skagit County are well endowed with these attributes. Such things as a variety of hills and gullies, streams, lakes, trees, and spectacular views should be considered as design resources which are nonrenewable if not used in a proper design context. Mineral resources are also an important

consideration within the planning area. Sand, gravel, and rock are of primary interest in planning for future needs and require care in the selection of areas where extraction activities will be compatible with adjacent land uses.

### 1.1.5 SUPPLEMENTAL INFORMATION

A broader evaluation of the planning implications of geologic consideration is presented in Comprehensive Land Use Planning Alternatives for the Skagit River Floodplain and Related Uplands, which is a supplement to this Comprehensive Plan for the Southwest/South Central District of Skagit County. The geologic topics covered in the above supplement are:

1. Climate and precipitation
2. Flora and fauna
3. Geologic factors affecting landforms
4. Mountain forming
5. Glaciation
6. Geology of specific areas
7. Planning implications
8. Man's relationship to earth processes

Additional data is contained in the tables which deal with the following subject area:

1. Movements of the land surface
2. Allowable bearing capacities of earth materials
3. Explanation of rocks of the study area
4. Divisions of geologic time
5. Pleistocene sequence in the Puget lowland

## 1.2 SLOPE

### 1.2.1 ELEMENT OF SLOPE

The two main elements of slope that must be considered when examining the possibility of development are steepness (slope %) and aspect (The orientation of a sloping ground surface with respect to geographic north).

#### 1.2.1.1 SLOPE STEEPNESS

Slope steepness affects the rate at which precipitation is drained from the surface. On steep slopes surface runoff is rapid and water does not long remain available to plants. On gentle slopes, much of the precipitation can penetrate the soil and become available for prolonged plant use. The thickness of the soil may be lessened by the process of erosion. Thus, the characteristics of the soil itself may often be related to slope steepness. The occurrence of certain geologic processes such as overland flow, earth flow, mud flow, landslides, rockfall, and soil creep are also directly related to the steepness of the slope and thus affect the amount to which a certain piece of land can be developed. The eroding capacity of these processes increases directly with the angle of the slope.

#### 1.2.1.2 SLOPE ASPECTS

The second element of slope which may have an effect on its use is slope aspect. As stated earlier, this concept is involved with the direction in which the slope is facing. It has direct influence upon plants by increasing or decreasing their exposure to sunlight and prevailing winds. Upon divides, peaks, and ridge crests the soil tends to be drier because of rapid drainage and because the surfaces are more exposed to sunlight and to drying winds. Generally speaking, slopes facing the sun have a warmer, drier environment than slopes facing away from the sun. Another example might be the location of a ski area. Some slopes have more snow, due in part to their slope aspect.

### 1.2.2 SLOPE MAP

For discussion purposes, slope has been classified and mapped into five categories. These are:

| | |
|---|---|
| 0-3% | 15-30% |
| 3-8% | 30+% |
| 8-15% | |

These categories are derived from Soil Conservation Service maps, and the United States Coast and Geodetic Survey map of the planning area. The slope maps locate these categories of slope on a generalized basis in the Southwest and South Central Planning Districts. Refer to Slope Map, Map E, Comprehensive Land Use Alternatives Study.

### 1.2.3 SUB-AREA ANALYSIS - SLOPE CHARACTERISTICS

#### 1.2.3.1 SOUTH SKAGIT FLOODPLAIN

The first, and probably most important area to be examined is the floodplain area. For ease in making this analysis more understandable, the Skagit and Samish Floodplains are broken up into three specific areas. The southern portion of the Skagit Floodplain will be the first to be examined. It covers approximately the area of Township 33N - 34N and Range 3E. This section of the floodplain is reasonably flat with a range of 0-3% slope over most of the land. However, there are areas of slope ranging from 3% to 15%, most notably the Pleasant Ridge area and the Fish Town area, near LaConner. When considering slope and its related aspects, some slopes tend to be more suitable to certain uses than others. The floodplain is best suited for agriculture and other compatible uses such as pasture, recreation, open space, and forestry.

This is partially due to the amount of 0-3% slope that is on the floodplain, the fertile alluvium soils left there by the river, and the rather high water-table that exists there. For the same reasons, extensive urban related development would be less satisfactorily located in this area. Drainage is rather poor in this area due to its nearly level slope, soil characteristics, and high water table. All of these, plus the frequent danger of flooding, place a burden on the amount of development that can conceivably take place within the floodplain. The Pleasant

Ridge and Fish Town areas do offer the possibility of some moderate intensity development. They contain some moderate slopes with good view characteristics. The major problems that hinder development in many such areas include the poor septic suitability, the potential for shrink/swell damage inherent in the soils, and the lack of sewers.

1.2.3.2 MOUNT VERNON/WALKER VALLEY AREA

Like the other major cities in the County, much of Mount Vernon lies in the floodplain. The area around East Mount Vernon does have some slopes ranging from 0-15%. However, it appears the characteristics of the predominately Bow soil causes some complications for development. This is primarily centered upon the unsatisfactory shrink/swell characteristics of this soil group. Septic suitability can also be a problem in this soil. The degree of success in overcoming these complications is related to the application of the architectural and engineering elements of each specific development design.

The Big Lake area and the slopes surrounding Walker Valley all have a gentle 3-8% slope. Also, parts of the valley between Big Lake and Lake McMurray have a 0-3% or 3-8% slope.

The ridge running southward from Mount Vernon, including the area east of Conway, has some fairly moderate slopes, although it is intermittently steep in places.

Taking into consideration only the dangers and complications of the floodplain, it would appear that Mount Vernon's potential growth area lies east of the present city. There is plenty of land available here with suitable slope characteristics. The variation in slopes would present a pleasing atmosphere in terms of design potentials.

The corridor running south through Walker Valley, around Big Lake, to Lake McMurray, has areas where the slope suitability and view characteristics are good.

### 1.2.3.3 MIDDLE SKAGIT RIVER

This is approximately the area in and around the Skagit River Valley from Sedro Woolley to Concrete. East of Sedro Woolley the river valley forms a narrow swath of fairly level land with a slope range of approximately 0-3%. The slope of the hills on the south side of the river tends to be more abrupt than that on the north, generally being 30% or better. The hills on the north side of the river valley, especially near Sedro Woolley, have a fairly substantial amount of area with 3-15% slope.

The flat portion of the river valley is within the flood danger area. This presents the same problems for development as stated earlier. The areas of moderate slope north of the river valley and closer to Sedro Woolley lend themselves to urban related development.

The South Central area is dominated by the Cultus Mountains, which rise to a peak elevation of 3,950 feet, and which are flanked to the west and north by the Skagit River floodplain.

## 1.2.4 PLANNING IMPLICATION

The numerous mountains, hills, and valleys of Skagit County are a product of many forces over a certain expanse of time. However, the general shapes and slopes that have been created were probably most influenced by the last glaciation, the constant flow of the Skagit River System and the movements of the earth's crust. By analyzing these slopes, one can understand both their potentials and their weaknesses in the proper functioning of our ecosystem.

## 1.2.5 SUPPLEMENTAL INFORMATION

The Comprehensive Land Use Planning Alternatives for the Skagit River Floodplain and Related Uplands has a more extensive discussion of the planning implications of slope and of view characteristics associated with topographic features of this area. The areas discussed are:

1. Slope steepness
2. Slope steepness and accelerated land erosion
3. Slope aspect
4. View characteristics
5. Slope analysis of the study area

## 1.3 SOILS

### 1.3.1 SOIL TYPES

Of the two hundred and twenty-six (226) soil types found in Skagit County, one hundred and sixteen (116) are represented in the Southwest and South Central portions of the county. Because many soil types are identical in composition, and are distinguished only by their differing degrees of slope, only the different series names will be listed. A detailed listing of soil types is available in the Skagit County Washington Soil Survey, prepared by the Soil Conservation Service, 1960. The soils found in the Southwest and South Central Planning Districts are:

| | |
|---|---|
| Alderwood | Nookachamps |
| Belfast | Norma |
| Bellingham | Osa |
| Bow | Pilchuck |
| Cagey | Puget |
| Carbondale | Puyallup |
| Cathcart | Rifle |
| Coastal beach | Riverwash |
| Cokedale | Rough broken land |
| Everett | Rough mountainous land |
| Giles | Rough rocky land |
| Gilligan | Samish |
| Greenwood | Saxon |
| Heisler | Semiahmoo |
| Indianola | Skiyou |
| Klaus | Snohomish |
| Kline | Thornton |
| Lummi | Thornwood |
| Lynden | Tidal marsh |
| Made land | Tisch |
| Mukilteo | Wickersham |

## 1.3.2 SUB-AREA ANALYSIS

It should not be inferred from the above list that area soil types are equally distributed or proportional in the amount of land they represent.

The Southwest region is characterized by Puget silt loam (Pg), one of the most extensive and productive soils of the county. However, because of its inherently poor drainage and slow surface run-off, its productivity is dependent on drainage practices (dikes, ditches, tide gates), which keep it from being regularly inundated. While such practices deprive the soil of river-borne organic matter which would be deposited during seasonal overflows, they nevertheless allow cultivation to occur on a regular basis, thus providing a stable economic base in the county.

Other soils which are closely associated with Puget silt loam are: Sumas silt loams; Puyallup fine sandy loam; Cokedale loam; and Sultan silt loam. Although they occur with less frequency than the Puget soil, they comprise a soils group that is characteristic of the river delta. Like the dominant Puget type, these soils also demonstrate the properties of poor drainage, slow surface run-off and a moderate to high natural fertility. Because of their poor drainage these soils have very severe limitations for septic tank sewage disposal systems. In addition, their location in the river floodplain exposes them to flood hazard, which, together with poor septic suitability, makes the greater part of the Southwest planning area unsuitable for urban-type development. An exception to the characteristic alluvial deposits of the floodplain occurs in the Pleasant Ridge area, which rises to a maximum elevation of 130 feet above sea level. Here the predominat soil type is Bow gravelly loam which occurs on plateau-like glacial uplands, and is derived from finely textured glacial till. Like the lowland soils, Bow soil has poor drainage and surface run-off characteristics, as well as severe limitations for septic systems. It is considered one of the county's best upland agricultural soils, and is used for pasturage and raising hay, oats, and grasses. Bow soils have only a moderate natural fertility, and require fertilizer maintenance to maintain productivity.

The South Central district of the planning area has the same soil types and characteristics as the Southwest district, along the northern and eastern boundaries flanking the Skagit River. Otherwise, this area is dominated by rough mountainous land, interspersed at lower elevations by Alderwood soils, and a variety of small, local deposits of other soil types, principally, Osa, Cathcart, and Bow. Taken as a whole, these soil types do not display a single set of characteristics, but vary considerably in drainage and run-off rates, septic suitability, shrink/swell, shear strength and permeability. Detailed information is available in the Soil Survey of Skagit County, prepared in 1960 by the Soil Conservation Service.

### 1.3.3 PLANNING IMPLICATIONS

Soils in the Southwest planning district are classified in capability classes II and III, which makes them suitable for tillage and pasture if proper management is exercised.

These are some of the most productive soils in the county, and represent the bulk of the area's agricultural lands. The area is alsoin the river floodplain, so is subject to potentially destructive floodwaters.

The South Central planning district is dominated by soils in capability classes VI - VIII. Class VI soils may be used for pasturage; however, class VII and VIII are not suitable for pasture, and none of the classes is suitable for tillage. The area is well suited to forestry, and provides wildlife habitat as well as recreational opportunities.

### 1.3.4 SUPPLEMENTAL INFORMATION

The Comprehensive Land Use Planning Alternatives for the Skagit River Floodplain and Related Uplands discusses soils in the following areas:

1. Soils study area - general overview
2. Soil forming processes
3. Soil characteristics
4. Properties of major soils groups
5. Soils suitability (planning implications)
6. Soil suitability table
7. Agriculture, pasture, forestry and soil suitability

Also refer to the Soils Map, Map C of the above study.

## 1.4 SEPTIC SUITABILITY

### 1.4.1 ELEMENTS OF SEPTIC SUITABILITY

Septic suitability is a term used to define the conditions pertaining to a certain area with respect to individual sewage disposal systems or subsurface drainfields. The suitability of an area is usually thought of in terms of degree (i.e., good, moderate, poor, very poor, etc.). The information presented in this section is an attempt to give a generalized picture of the septic suitability of the study area. Every site proposed for development should be tested thoroughly.

Strict regulations pertaining to the use of septic tanks are necessary because of the potential health hazard involved if a system fails. For this reason, septic tanks are considered to be an interim solution to the problem of sewage disposal.

Land areas are classified in one of four categories: a) possessing only slight limitations with regard to septic suitability; b) possessing moderate limitations; c) being of a variable nature (primarily with regard to soil depth and slope); and d) possessing severe limitations.

### 1.4.2 SEPTIC SUITABILITY MAP

A Septic Suitability Map is provided for various areas in the Planning Districts. It must be emphasized that this is a generalized map. It does, however, give an initial insight into the septic suitability of a general area. The only way to obtain accurate information as to the suitability of a specific area is to perform a series of tests at that site during the time of greatest precipitation. Refer to the Septic Suitability Map, Map D, Comprehensive Land Use Planning Alternatives Study.

### 1.4.3 SUB-AREA ANALYSIS

#### 1.4.3.1 SOUTHWEST DISTRICT

Generally, the soils in the Southwest area have characteristics which make them unsuitable for their use as septic drain fields. However, due to the extreme variability of septic suitability, this plan will not

generalize by sub-area. The need for a percolation test prior to development is emphasized for all non-sewered developments.

1.4.3.2 SOUTH CENTRAL DISTRICT

Due to the extreme variability of septic suitability this plan will not generalize by sub-area. The need for percolation test prior to development is emphasized for all non-sewered developments.

1.4.4 SUPPLEMENTAL INFORMATION

The report, Comprehensive Land Use Planning Alternatives for the Skagit River Floodplain and Related Uplands, deals in greater depth with the whole question of septic suitability and provides a generalized table which analyzes the septic suitability of the various soils types found in the Southwest and South Central Planning Districts.

1. Planning implications
2. Suitability criteria
3. Septic tank design
4. Suitability map analysis
5. General septic suitability of Skagit County Soils

## 1.5 THE FLOODPLAIN, FLOODING, AND FLOOD DAMAGE PREVENTION AND PROTECTION

### 1.5.1 THE FLOODPLAIN

Floodplains are by definition where rivers flood. The floodplain is just as much a part of its natural course as the channels which carry normal and low flows. In Skagit County this includes: the entire floor of the Skagit River Valley, the delta of the Samish and Skagit Rivers, and the reclaimed tidelands adjoining the Skagit, Samish, and Stillaguamish River Basins. This area is approximately 90,000 acres, including 68,000 acres of fertile farmland downstream and west of Sedro Woolley, and 22,000 acres upstream.

Land use throughout the floodplain is characteristically rural and agricultural.

### 1.5.2 FLOODPLAIN MAP

The floodplain map, map H, Comprehensive Land Use Planning Alternatives Study, displays the 100 year floodplain for most of Skagit County.

### 1.5.3 FLOODING

Flooding occurs when the floodplain is inundated by stream flows in excess of the capacity of the stream channel.

The Skagit River is subject to two distinct types of floods; winter and summer. Most of the exceptional winter floods have occurred in November or December, the summer floods in May or June.

The large winter floods result from storms moving in from the Pacific Ocean. The precipitation associated with these storms is intensified as the air currents are forced upward over the Cascade Mountains. Temperatures accompanying these storms are often high enough to melt some of the snowpack. If, in addition, the ground is saturated from previous precipitation, surface runoff is increased. The runoff swells creeks and streams which fill the main river channel to capacity. As the increasing flow proceeds downstream, the flatter grades cause a reduction in river velocity and the river spreads out onto the floodplain.

The crests of summer floods are caused mainly by the hot summer sun melting the glaciers and snowfields in sparsely timbered or open areas. The peak stages of the greatest summer floods are considerably lower than those for the great winter floods. The summer floods, however, are of much longer duration and are greater in volume than the winter floods. The crops are growing at the time of summer floods and, if the dikes fail, the damage done is accentuated by the fact that the long duration and great volume of the floods prevent repairing of the dikes and levees.

Refer to Table 1.5.1.1 Floods Since 1815.

## 1.5.4 PROTECTIVE AND PREVENTATIVE STRATEGIES TO REDUCE FLOOD DAMAGE

Historically, floodplains have been the site for urban growth and development because of their proximity to transportation routes (rivers) and their level topography, which minimizes construction costs. However, as valley residents know, floodplain development creates serious problems when the Skagit River follows its natural tendency to flow across the floodplain when its normal channel capacity is exceeded. This plan will address the various means of reducing flood damage.

Methods of flood loss reduction may generally be viewed in terms of protective and preventive strategies. Protective measures consist of attempts to "stop the flood water, where it falls" and "keep the flood water away from people." Preventative measures seek to "keep people away from the flood water." Watershed management and engineering works fit into the former category, and human adjustment to flooding into the latter.

## 1.5.5 "STOPPING THE WATER WHERE IT FALLS"

### 1.5.5.1 WATERSHED MANAGEMENT

Watershed management, which includes land treatment and soil conservation, can help decrease the volume and velocity of water flowing into upstream channels, thereby reducing river flood hazards. By improving the soil structure, an increase in retention capacity of precipitation and snowmelt is promoted. In addition, vegetative cover tends to increase the rates of water infiltration.

Most of the Skagit River watershed, above 500 feet, is forested. The land comprising this area, with few exceptions, is owned by timber companies, the state, or the federal government.

Timber harvest and management affect the function of a watershed to regulate the runoff and infiltration of precipitation. The State Forest Practices Act regulates timber harvesting on state and private lands. The county has input into the implementation of the Act only in operations involving designated shorelines, removal of land from forestry use, and the development of gravel pits. The federal lands are managed in accordance to their own regulations with no county input into their forest practices. As a result of state and federal control of forest practices, the county is limited in its ability to develop and implement policies related to watershed management in most of the watershed.

1.5.5.2 PRESERVING WETLANDS

Wetlands in a watershed help to maintain the natural water storage capacity of the river basin. Wetlands can perform a function similar to that of a reservoir by modifying high and low flow of the river. They also can reduce flood damage by storing water from precipitation and upland runoff.

The major wetland area that stores floodwaters from the Skagit is the Nookachamps Creek area. This area of about 5,000 acres provided approximately 34,000 acre-feet of storage for the 1951 flood which reduced the peak flow by 6,000 c.f.s.

By preserving wetlands in their natural state, natural detention areas for floodwaters are kept intact.

1.5.6 "KEEPING THE WATER AWAY FROM THE PEOPLE"

1.5.6.1 CURRENT FLOOD WORKS

Present flood control works on the Skagit River include levees, bank protection and stabilization works, and upstream storage. These works are all designed to reduce damage by containing river flow during flood periods.

TABLE 1.5.1 FLOODS SINCE 1815

| FLOOD | NEAR CONCRETE | NEAR SEDRO WOOLLEY | NEAR MOUNT VERNON |
|---|---|---|---|
| 1815 | 500,000 cfs | 400,000 cfs | N/A |
| 1856 | 350,000 cfs | 300,000 cfs | N/A |
| November 1896 | N/A | 185,000 cfs | N/A |
| November 1897 | 275,000 cfs | 190,000 cfs | N/A |
| November 1906 | N/A | 180,000 cfs | 180,000 cfs |
| November 1908 | N/A | 97,000 cfs | N/A |
| November 1909 | 260,000 cfs | 220,000 cfs | N/A |
| November 1910 | N/A | 114,000 cfs | N/A |
| January 1914 | N/A | 104,000 cfs | N/A |
| December 1917 | 220,000 cfs | 195,000 cfs | N/A |
| December 1921 | 240,000 cfs | 210,000 cfs | N/A |
| February 1932 | 147,000 cfs | N/A | N/A |
| November 1932 | 116,000 cfs | N/A | N/A |
| December 1933 | 101,000 cfs | N/A | N/A |
| January 1935 | 131,000 cfs | N/A | N/A |
| October 1945 | 102,000 cfs | N/A | 94,300 cfs |
| November 1949 | 154,000 cfs | 140,000 cfs | 114,000 cfs |
| February 1951 | 139,000 cfs | 150,000 cfs | 144,000 cfs |
| November 1955 | 106,000 cfs | 113,000 cfs | 107,000 cfs |
| April 1959 | 90,700 cfs | 92,000 cfs | N/A |
| November 1959 | 89,300 cfs | 91,000 cfs | 91,600 cfs |
| November 1962 | 114,000 cfs | N/A | 83,200 cfs |
| December 1975 | 122,000 cfs | 121,000 cfs | 130,000 cfs |

### 1.5.6.1.1 LEVEES

The existing levee and sea dikes were constructed by 16 diking districts and a few private individuals. The diking districts maintain 55.8 miles of levees and 39 miles of sea dikes to protect 45,000 acres of land. Individual owners maintain 16 miles of levees to protect 1,000 acres. The level of protection afforded by diking district levees is summarized in Table 1.5.2 Overtopping of low areas in the levee system begins at flows of 84,000 cfs. By sandbagging and minor flood fighting, the levees have held against a 91,000 cfs flow (Mount Vernon Gage). The entire city of Burlington relies on levees for flood protection. Conway, West Mount Vernon, the central business districts of Mount Vernon, and residential areas to the south are also protected by levees. LaConner is protected from high tides by the sea dike along the Swinomish Channel. Interior dikes prevent Skagit River overflows from reaching the city.

### 1.5.6.1.2 BANK PROTECTION

With financial aid from the Agricultural Stabilization and Conservation Service and the State of Washington, property owners and Skagit County constructed extensive bank stabilization works along the river in an effort to reduce land losses caused by erosion. For the most part, these projects consisted of rock revetments. Pile and plank walls and other means were also used with varying results. In recent years, most of the bank protective work has been done by the diking districts with the help of County, State and Federal agencies to prevent erosion and the undermining of levees.

### 1.5.6.1.3 UPSTREAM STORAGE

Negotiations are currently proceeding to permanently increase flood control storage from 16,000 to 84,000 acre-feet in the reservoir behind the Baker Dam. This additional storage was available during the winter of 1977-78.

Ross Reservoir has 120,000 acre-feet of storage reserved for flood control. This reservoir controls inflow from approximately 1,000 square miles of upstream drainage area, or about one-third of the total Skagit River watershed. Flood storage behind Ross Dam is used only when the

TABLE 1.5.2 PROTECTION BY DIKING DISTRICT LEVEES

| Location | Miles of Levee | To Flow (cfs) | Recurrence Interval (years) |
|---|---|---|---|
| Skagit River | | | |
| Right bank-Burlington to the mouth of the North Fork (River Mile 2-21) | 16.1 | 108,000 | 5 |
| Left bank-Burlington to Mt. Vernon (River Mile 21 to 13) | 7.5 | 143,000 | 14 |
| Left bank-Mt. Vernon to mouth of the South Fork (River Mile 13 to 2) | 14.4 | 101,000 | 4 |
| Left bank of the North Fork | 5.5 | 91,000 | 3 |
| Right bank of the South Fork | 6.0 | 91,000 | 3 |
| Samish River | | | |
| Right bank | 4.3 | 123,000 | 8 |
| Left bank | 2.0 | 123,000 | 8 |
| TOTAL | 55.8 miles | | |

discharge at Concrete is forecasted to be 90,000 cfs or greater. The effectiveness of this storage during the winter flood periods depends upon variable storm characteristics. Under average conditions, Ross Dam reduces flood crests by 15,000 to 25,000 cfs at Sedro Woolley.

1.5.6.2 AUTHORIZED FLOOD CONTROL PROJECTS

1.5.6.2.1 DIVERSION CHANNEL

The Avon Bypass project was authorized by the Flood Control Act of 1936 and was reactivated in 1960. This project would divert about 60,000 cfs of Skagit River floodwaters from near Burlington to Padilla Bay and increase flood protection for the 68,000 acre delta downstream from Sedro Woolley and the towns of Burlington, Mount Vernon, Conway and LaConner.

The Avon Bypass would discharge silt and freshwater into Padilla Bay, which would have an undetermined effect on the area's fish, shellfish and waterfowl. Currently there is a project at the state and federal level, with approval by the county, to protect the Bay as an Estuary. This protection if enacted could preclude the construction of the bypass. Another impact that would be associated with this project is the removal of about 500 acres of prime agriculture land from production by the bypass and its right-of-way.

1.5.6.2.2 LEVEE AND CHANNEL IMPROVEMENTS

The Federal Flood Control Act of 1966 authorized strengthening existing levees and minor channel improvements along the lower 17 miles of the Skagit River. This project would increase the present maximum channel capacity from 91,000 cfs to about 120,000 cfs.

The U.S. Army Corps of Engineers is currently reviewing the project authorized by the 1966 Act to determine if the project should be modified because of changed criteria or conditions. The Crops prepared six alternatives, which are summarized briefly below.

# ALTERNATIVE 1

## DO NOTHING

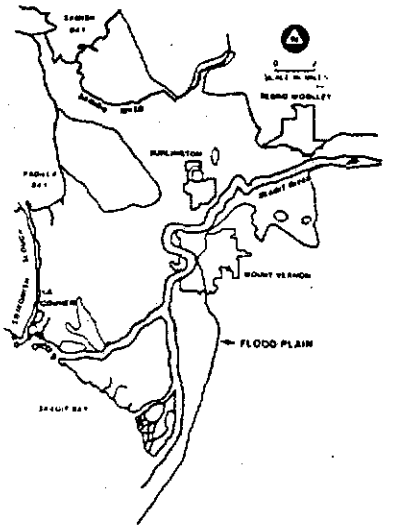
DESCRIPTION: No new action would be taken for flood damage reduction through either structural or non-structural means. Development on the flood plain would be restricted through existing zoning. Flood proofing of future structures would be required as part of a flood insurance program that would indemnify property owners against losses. Undeveloped lands in the flood plain could be preserved for parks and open space.

Implementation costs.

| | |
|---|---|
| Federal | Flood plain information studies<br>Flood insurance studies |
| Washington State<br>Skagit County<br>Cities | - Zoning, land purchase,<br>and park development |
| Individuals | - Floodproofing |

Annual management costs.

| | |
|---|---|
| Federal | insurance premiums subsidy, emergency operations |
| Local | administration and maintenance of parks and zoning, emergency operations |
| Individuals | floodproofing maintenance, insurance premiums |




# ALTERNATIVE 2

## LOW LEVEES

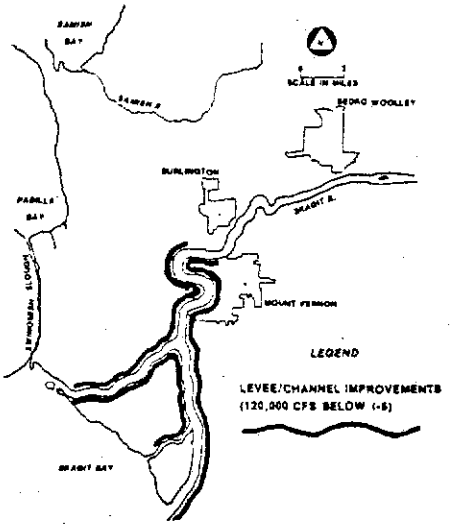
DESCRIPTION: Involves raising and strengthening the existing levee system from the mouths of the Forks upstream to the railroad crossing and improving the hydraulic capacity of the North Fork and Freshwater Slough so that the safe channel capacity downstream from the railroad bridge is 120,000 c.f.s. Development on the flood plain would continue to be restricted through existing zoning. The existing flood warning system would provide flood forecasts and emergency information.

Implementation costs.

| | |
|---|---|
| Federal | $15,100,000 (1956 report updated to |
| Local | $ 560,000 1977 prices) |

Annual management cost.

| | |
|---|---|
| Federal | None |
| Local | $15,000 (in addition to present costs) |




# ALTERNATIVE 3

## RURAL AND URBAN LEVEES

DESCRIPTION: Includes alternative 2 and in addition would provide a high degree (100-year) of flood protection to the urban area of Burlington and Mount Vernon by a high levee system. Flood plain management would continue to be required for those areas lying outside the high levees. This would include zoning, flood proofing of future structures, the flood warning system, etc. Undeveloped lands could be used for parks and open space.

Implementation costs.

| | |
|---|---|
| Federal | $27,000,000 - 53,000,000 (preliminary |
| Local | $ 3,000,000 - 7,000,000 estimate-not based on detailed studies) |

Annual management costs.

| | |
|---|---|
| Federal | None |
| Local | $50,000 - 70,000 |