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ABSTRACT

The first paper in this volume, "Geomorphic Effects of Flood-Control Channel Works" (H. Rasid), examines the basic mechanisms of morphologic instabilities in man-made or modified channels in terms of their altered hydraulic characteristics and geomorphic responses to such induced changes. Two tables, two figures, and a 33-item bibliography are included. "An Exploratory Study of Bankruptcy and Its Ecological Correlates in North Dakota" (P. Meartz) examines bankruptcy as an indicator of economic stress within a community. An attempt is made to explore the nature of the ecological setting in which bankruptcies occur in North Dakota. Four maps and a 28-item bibliography are included. "Initial Development of North Dakota's First Geography Awareness Week" (D. Munski) chronicles North Dakota's participation in the first annual Geography Awareness Week, a nationwide celebration. A 9-item bibliography is included. "North Dakota Lesson Plan Packet" (A. Asbeck; D. Munski) is a compilation of lesson plans for precollege geographers, intended for local reproduction and use. The final section of the Bulletin contains nine evaluative book reviews. (JB)

BULLETIN

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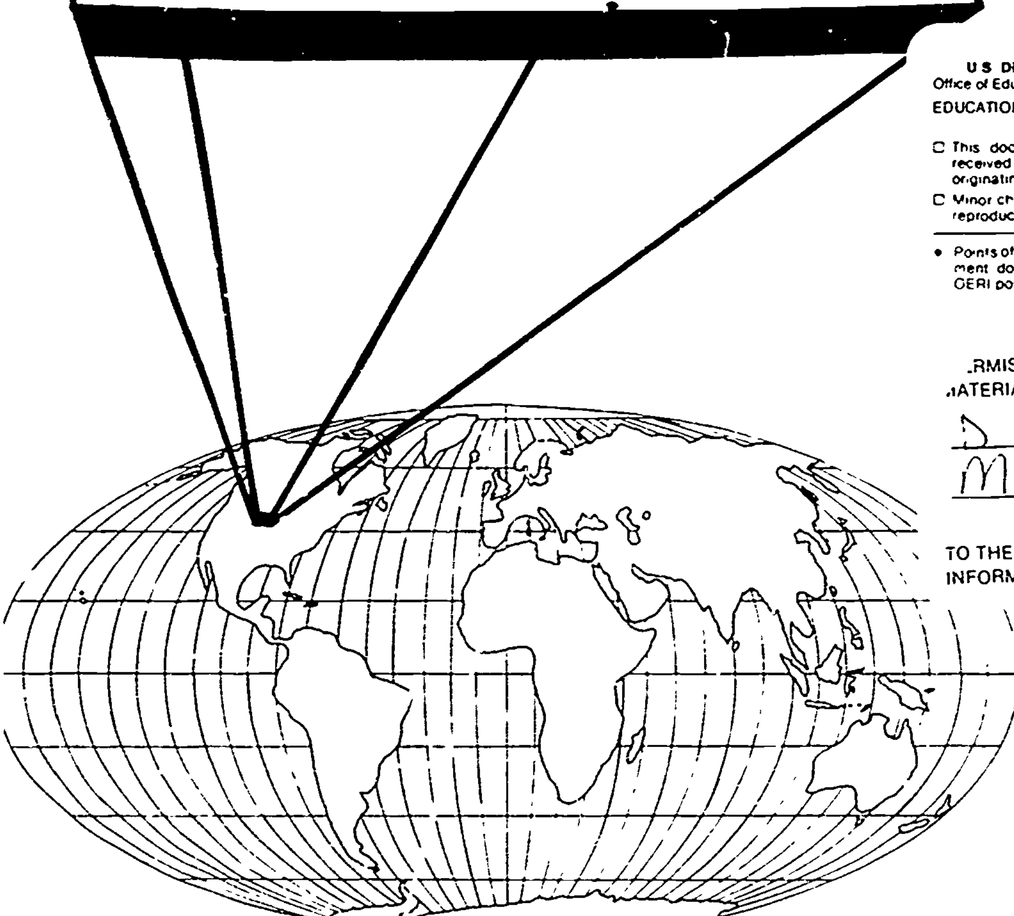

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BULLETIN

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ASSOCIATION OF NORTH DAKOTA

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VOLUME XXXVII 1987

The Association of North Dakota Geographers was founded in 1947. In the forty years since its founding, thirty-six volumes of the Bulletin have been produced in an attempt to meet the organization's constitutional objective of disseminating geographical knowledge and understanding throughout North Dakota. In recent years several special publications have been issued in lieu of the Bulletin.

For further information concerning the Association of North Dakota Geographers or its previous publications, write the Association of North Dakota Geographers at the address below.

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Local typing of this issue was supervised by Ms. Cindy Purpur; she was assisted by Ms. Kari Benson. Support for this publication has come in part from the membership fees of the Association of North Dakota Geographers with additional assistance coming from the Department of Geography of the University of North Dakota. Also providing support for this publication were these units at the University of North Dakota: the College of Arts and Sciences and the Division of Continuing Education.

Editor's Note:

Welcome to the 1987 edition of the Bulletin of the Association of North Dakota Geographers. This year's issue of the journal of North Dakota's only statewide organization of geographers and affiliate of the National Council for Geographic Education covers a number of diverse topics. What unifies this issue, however, is the focus upon different approaches to geographical inquiry.

Our first paper has been contributed by Dr. Harun Rasid of Lakehead University. Dr. Rasid's manuscript is presented in a format different from the usual Bulletin of the Association of North Dakota Geographers issues because our word processing computer software was incompatible for printing his mathematical formulas. Still, Dr. Rasid's conclusions about geomorphic effects of flood-control channel works are not incompatible for usage by other geographers.

Dr. Paul Meartz's study of bankruptcy and its ecological correlates in North Dakota is our second paper. This is the first time that a geographer from a North Dakota institution of higher education has explored the relationship of bankruptcy to the ecological setting of North Dakota. It is hoped that this will be the first of a series of research papers from geographers on this topic concerning North Dakota's economic geography.

Our third paper is the history of the initial development of North Dakota's first Geography Awareness Week, a paper contributed from Dr. Douglas C. Munski. That the editor of the Bulletin of the Association of North Dakota Geographers has provided this invited manuscript is a reflection of the concern by the officers of the Association of North Dakota Geographers to preserve the history of this organization concerning 1987, the first year in which there has been a celebration of Geography Awareness Week. As Dr. Warren Kress pointed out to Dr. Munski during the 1987 Fall Conclave of the Association of North Dakota, our organization has a rich heritage of supporting geographic education and should be reminded of those roots in our profession.

In keeping with the theme of promoting geographic education, a set of lesson plans has been compiled by Ms. Ann Asbeck and Dr. Munski for pre-college geographers. This section of this year's journal specifically is to be reprinted locally by members for usage in elementary schools, junior high schools, and high schools. Special thanks is given to Ms. Asbeck, a grant coordinator at the University of North Dakota, for her organizing and editing of these lesson plans in conjunction with Dr. Munski's work.

This issue's book reviews have been compiled by Dr. William A. Dando, University of North Dakota. These reflect the efforts of his students in GEOG 587 (Introduction to Research and Writing) at the Grand Forks campus, and Dr. Dando's assistance in readying these book reviews for this publication is appreciated.

Finally, special thanks must be given to the reviewers for the 1987 issue. These individuals are Dr. John Wyckoff, University of North Dakota, Dr. Robert Seidel, North Dakota Geological Survey, Dr. Eric Clausen, Minot State University, Ms. Jean Eichhorst, University of North Dakota, Dr. Roland D. Mower, University of North Dakota, and Mr. Robert Kulack, Schroeder Junior High School of Grand Forks, North Dakota. Naturally, this entire effort could not have been accomplished were it not for the assistance from the Department of Geography of the University of North Dakota, and a note of gratitude must be given in particular to Ms. Cindy Purpur, departmental secretary, for her patience and continued good humor about dealing with this and other issues of the Bulletin of the Association of North Dakota Geographers.

-- Douglas C. Munski

GEOMORPHIC EFFECTS OF FLOOD-CONTROL CHANNEL WORKS

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Abstract. Geomorphic effects of flood-control channel works can be predicted in a qualitative way by using the continuity equation, one of the resistance equations and a number of empirical functional relationships among some hydraulic variables. Spatial variations in morphologic adjustment (i.e. changes in channel geometry and channel plan form) in the Assiniboine Diversion and the Neebing-McIntyre floodway have been interpreted by using such functional relationships. Morphologic instability in a modified or constructed channel results from the lack of adjustment between the geometric forms of the new channel and its sediment-flow regime. During high flows the stream power of the new channel exceeds its sediment load because of an increase in velocity which, in turn, results from an increase in depth, energy gradient and hydraulic radius and a decrease in wetted perimeter and roughness factor. The increased stream power results in channelbed degradation or erosion. During low flows the stream power falls short of its load, resulting in aggradation. Most of these instabilities could be minimized by employing innovative channel design guidelines that emulate the hydraulic and morphologic equilibria of natural meandering streams, because a meandering channel provides a more efficient sediment routing and storage system than a straight trapezoidal channel.

INTRODUCTION

Flood-control channel works are defined here as any engineering modification of an existing stream channel or the construction of an entirely separate channel for efficient disposal of flood waters. In addition to traditional channelization projects involving straightening or realigning of existing streams, other such channel works include the construction of different types of floodways and diversion channels; river training works such as the construction of dikes, revetments and floodwalls; and other minor projects such as clearing and snagging of stream vegetation. The scientific literature is replete with examples of morphologic effects of channelization (e.g. Daniels 1960; Emerson 1971; Yearke 1971; Parker and Andres 1976; Barnard and Melhorn 1982; for a comprehensive review see Brookes 1985). All of these studies deal with case histories of morphologic instabilities in individual flood-control channels resulting from straightening of meandering streams. None of them examines the basic mechanisms of morphologic instabilities in man-made or modified channels in terms of their altered hydraulic characteristics and geomorphic responses to such induced changes.

Morphologic instabilities in a modified or constructed channel result from the lack of adjustment between the geometric forms of the new channel (i.e. straight alignments and trapezoidal cross-sections) and its sediment-flow regime. The nature of probable morphologic changes in such a channel can be derived from the basic principle of regime theory: 'when an artificial channel is constructed in erodible material and is used to convey silty water, both bed and banks will scour and fill, changing depth, width and gradient, until a state of balance is attained at which the channel is said to be in regime' (Blench 1969). In this process of channel adjustment a number of hydraulic variables are interrelated in such a way that changes in one can trigger adjustments in one or more of the others. For this reason there is no way to predict precisely what will happen when width, depth, slope, channel roughness or channel pattern are manipulated simultaneously in an artificial channel (Nunnally 1985). Nonetheless, a number of functional relationships, that have been derived empirically from the regime behaviour of man-made channels, provide a basis for predicting qualitative responses to channel works. Using such functional relationships, the main objective of this paper is to review the basic mechanisms of post-constructional geomorphic responses in flood-control channels resulting from induced changes in their hydraulic characteristics. Field evidence of actual geomorphic effects of flood-control channel works is provided by using case studies of the Assiniboine Diversion in Manitoba and the Neebing-McIntyre floodway in Thunder Bay, Ontario. Finally, the paper reviews alternative construction design procedure that would minimize morphologic instabilities in flood-control channels.

CHANGES IN HYDRAULIC CHARACTERISTICS

The basic objective of flood-control channel works is to improve flow conveyance by changing the hydraulic characteristics of the channel. Changes may occur in the following hydraulic variables: width (w), depth (d), channel roughness (n), channelbed slope (S_o), energy gradient (S_f) and flow velocity (v). The most obvious result of channel excavation or dredging is not only an increase in width and depth but also a significant reduction in roughness factor, as the constructed channel has a relatively smooth wetted perimeter (wp) devoid of channel irregularities such as bars, dunes, bends and vegetation. A reduction in roughness factor results in an increase in flow velocity, according to

Manning's roughness equation:

$$v = (1/n)R^{1/3}S^{1/2} \qquad \text{(equation 1)}$$

where v = mean velocity (m s^{-1})

R = hydraulic radius (m)

S = energy gradient (m m^{-1})

n = Manning's roughness coefficient (non-dimensional unit)

In natural alluvial channels values for the (n) may range from roughness coefficient 0.033 for relatively clean meandering alignments with pools and riffles to 0.15 for reaches with deep pools, extensive weeds and/or heavy stands of timber and underbrush. In contrast, channelized streams with uniform straight alignments usually have n-values ranging from 0.016 to 0.022 immediately following construction (Chow 1959, 112). In general, the value of n decreases as the boundary is smoother, causing a reduction in friction and an increase in velocity. As flood-control channels have relatively smooth boundaries, average velocities in such channels are expected to be higher than in natural channels. Actual velocities, however, are determined by a number of hydraulic parameters, such as the volume of flow (Q), hydraulic depth (A/w), hydraulic radius (A/wp) and slope (S). During low discharges the hydraulic depth in a trapezoidal channel is relatively shallow due primarily to a wide cross-section. From the continuity equation

$$Q = wdv \qquad \text{(equation 2)}$$

where Q = discharge (m^3s^{-1})

w = width (m)

d = depth (m)

v = velocity (m s^{-1})

it can be shown that an increase in width (w) at a constant pre- and post-constructional discharge (Q) is compensated for by a decrease in depth (d) and velocity (v). The projected velocity during low flows is thus lower in a conventional trapezoidal flood-control channel than in a natural stream. During peak discharges, on the other hand, the velocity in such a channel may exceed that in a pre-constructional channel mainly because of its reduced wetted perimeter and increased hydraulic radius. Prior to flood-control channel works the wetted perimeter of a natural stream may extend we . into the flood plain depending on the extent of overbank spilling during floods. If the new channel is designed to eliminate overbank spilling, high flows will be contained within the constructed channel, resulting in a reduction in wetted perimeter and an increase in hydraulic radius and depth. From a hydraulic view point the channel section having the least wetted perimeter for a given water area has the maximum conveyance (Chow 1959). A significant reduction in width of flood flows is thus compensated for by an increase in velocity and depth.

Another important variable that controls flow velocity is the slope, expressed either as the invert slope (S_o) of the constructed channel or as the energy gradient (S_f) of the water surface. The relationship between velocity ,d slope can be derived from Manning's equation (equation 1) as well as from the well-known Chezy formula:

$$v = c \sqrt{RS} \qquad \text{(equation 3)}$$

where c = a resistance factor that is large for smooth boundaries and small for rough boundaries offering resistance.

R and S are the same as in equation 1

According to this equation velocity increases as the square root of hydraulic radius and the square root of slope. To put it another way, slope is directly proportional to the square of velocity. Flood-control channels have relatively steep slopes either because straightening of a meandering channel results in shortening the flow line, thereby increasing gradient, or because artificial channels such as floodways are usually constructed with relatively steep invert slopes for efficient flow conveyance. For uniform flows, a steeper invert slope (S_o) results in a steeper energy gradient (S_f), which is closely approximated by the slope of the water surface (S_w). In flood-control channels accelerated flow velocities may thus result from such energy gradient components.

It appears from the foregoing discussion that it is possible to interpret hydraulic characteristics of flood-control channels by using the continuity equation (equation 2) and a number of resistance equations, such as equations 1 and 3. A major component of modern engineering construction and planning of flood-control channels is the computation of design flows by using a number of routine hydraulic analysis programs. One such well-known computer program is the HEC-2 backwater model which was developed by the Hydrologic Engineering Centre of the U.S. Army Corps of Engineers (1981). The computational method in HEC-2 applies Bernoulli's energy equation at each cross-section and Manning's equation for the friction head loss between cross-sections. Inputs of the program include, among other variables, historical flow data from instrumented watersheds or modelled flow data from ungauged watersheds, cross-sectional data on the design channel and calibrated Manning's n values. The final output lists a number of user-oriented variables of projected water surface profiles such as discharge (Q), depth (d), velocity (v) and energy gradient (Sf).

GEOMORPHIC RESPONSES

Geomorphic responses to altered flow characteristics in flood-control channels can be derived from the relationship between *unit stream power* and sediment transport rate.

Stream power (ϕ) is the rate of work done by the fluid or the rate of energy loss per unit length of stream (Schumm 1977). It has been variously defined by using different hydraulic parameters, but the simplest definition has been given by Yang (1972) as the product of discharge and slope, that is

$$\phi = QS \qquad \text{(equation 4)}$$

Unit stream power (0_w) is simply the stream power of water per unit area and is expressed by dividing the stream power at a cross-section by the average width of the cross-section, that is

$$\phi_w = QS/w = (w.d.v.S.)/w = d.v.S. \qquad \text{(equation 5)}$$

The general relationship between stream power and sediment transport rate can be expressed by Lane's (1955) classic equation of sediment transport at an equilibrium state:

$$QS \sim Q_s d_{50} \qquad \text{(equation 6)}$$

where Q_s = sediment discharge

d_{50} = median particle size of bed material

A channel is in equilibrium if it exhibits the minimum rate of energy dissipation under the existing climatic, hydrologic, hydraulic and geologic constraints (Yang 1976). Energy dissipation is caused by friction from roughness along the wetted perimeter, by friction between flow lines and by transportation of sediment load. Of the total energy losses within a stream, energy utilized for transportation is very small (3%) compared to that dissipated by friction (Leopold et al. 1964). For this reason any change in channel roughness factor causes a significant change in sediment transporting power. If the construction of a flood-control channel results in a substantial increase in velocity and stream power due to its lower roughness coefficient (according to equation 1) and due to its deeper, faster and steeper flows (according to equation 5), it follows from equation 6 that this should result in a proportionate increase in sediment transport rate. The increased sediment is then yielded by channelbed erosion or degradation. A decrease in stream power during low flows, on the other hand, would result in deposition (or aggradation). The proces of channelbed degradation and aggradation would continue until the slope, velocity, roughness and channel pattern adjust to the minimum rate of energy dissipation, i.e. the equilibrium state (Yang and Song 1979). This is the basic mechanism of accelerated degradation and aggradation in flood-control channels.

Although the basic principles of geomorphic change in flood-control channels are fairly well understood, forecasting precise changes is difficult, because it is not possible to isolate and study the role of an individual variable among a large number of variables that control alluvial channel morphology. However, hydraulic engineers and fluvial geomorphologists who have studied this problem using field observations and laboratory flume experiments have succeeded in developing a number of qualitative multivariate equations that can be used for predicting the general response of channel systems to change. For example, when a meandering stream is shortened by straightening, the sequence of geomorphic responses in the altered channel can be derived from the following equations:

$$P \sim 1/Q_{sb} \quad \text{(equation 7) (proposed by Santos and Simon 1973)}$$

$$Q_{sb}^{+}\, Q_{w}^{o} \sim S^{+}, d^{-}, w^{+}, w/d^{+} \quad \text{(equation 8) (Schumm 1977)}$$

where P = sinuosity
Q_w = discharge of water
Q_{sb} = bedload discharge
w/d = width/depth ratio

Straightening a channel reduces its sinuosity and increases its slope. At a constant discharge an increased slope will result in an increase in stream power, according to equation 6. This in turn will result in bed and bank erosion and an increase in sediment/bedload discharge. Thus, one of the initial geomorphic responses of a channel to its reduced sinuosity may be an increase in its bedload transport, hence sinuosity is inversely proportional to bedload discharge (equation 7). Much of the bedload may be deposited in a downstream reach resulting in flattening of the gradient. Erosion is a negative feedback mechanism that works to restore stream stability by lowering channel gradient and increasing bed material size (Nunnally 1985). Bank erosion in upstream reaches and aggradation in lower reaches results in a wider and shallower channel. In other words, an increase in bedload (Q_{sb}^{+}) at a constant water discharge (Q_w^{o}) may result in an increase in width/depth ratio (w/d^{+}), as indicated by equation 8. Channel widening often leads to extensive aggradation and development of mid channel bars (braiding) with local steepening of gradient (Nunnally 1985). In river training projects the opposite effect of channel straightening and widening is achieved, that is sinuosity is induced in a braided reach by placing artificial structures (such as permeable pile dikes) within the channel. At a constant discharge and sediment load an increase in sinuosity results in a decrease in bedload transport, according to equation 7. For this reason river training projects have been highly successful in inducing single, simple meandering channels by manipulating bedload transport (Simons and Senturk 1977).

In case of river confinement by embankments the basic goal is to increase the depth of flow and velocity during high discharges. This may cause an increased ability to transport bed material. As sinuosity is inversely proportional to bedload discharge (equation 7), an increase in bedload in a meandering channel may initiate pattern instability, eventually changing it into a braided reach (Simons 1971). On the contrary, confinement of a braided reach may result in a more stable, better defined channel as it will be able to transport more bed material at flood stage. Much of the observed instability in braided reaches is due to excess of bed material discharge (Simons 1971).

In channel straightening and river training projects discharge (Q_w) and sediment load (Q_s) are kept constant; only channel morphology is altered. In the case of a diversion project an increase or decrease in discharge could be caused by diversion of water into or out of a river system. If flow is stored in a reservoir prior to diversion, a decrease in sediment discharge may occur in the diverted flow. The following functional relationships predict channel responses to a combination of increased or decreased discharge and sediment load.

$Q_s^- \, Q_w^- \sim S^+, d^+, w^-, P^+$ (equation 9) (Schumm 1977)

$Q_s^o \, Q_w^+ \sim S^-, d_{50}^+, d^+, w^+$ (equation 10) (Santos and Simons 1973)

$Q_{sb}^+ \, Q_w^+ \sim S^+, d^+, w^+, w/d^+, P^-$ (equation 11) (Schumm 1977)

Equation 9 indicates that if a decrease in sediment load is accompanied by a simultaneous decrease in discharge, as in the case of downstream flow from a reservoir, the channel response could be an increase or decrease in slope and depth but a likely increase in sinuosity and a decrease in width. A fuller discussion of downstream geomorphic responses to dam construction is beyond the scope of this paper.

When flow is diverted from a reservoir into a floodway relatively clear water is released, because a large part of the inflowing suspended sediment of the river settles down in the reservoir. The sediment inflow into the diversion channel, therefore, remains constant (Q_s^o) with increasing release of water (Q_w^+). An increase in discharge (Q_w+) results in an increase in stream power and, according to equation 6, should lead to channel erosion for picking up the potential sediment load (Q_s). Consequently, depth, width and bedload transport should increase, as indicated by equation 10, but gradient should decrease since erosion is a negative feedback mechanism.

When both discharge and bedload increase, perhaps as a result of diversion of water from one stream to another, equation 11 indicates that both width and width/depth ratio should increase but sinuosity should decrease. The influence of increasing discharge and bedload on depth and gradient are in opposite directions, and it is not clear in what manner gradient and depth should change (Schumm 1977, 136).

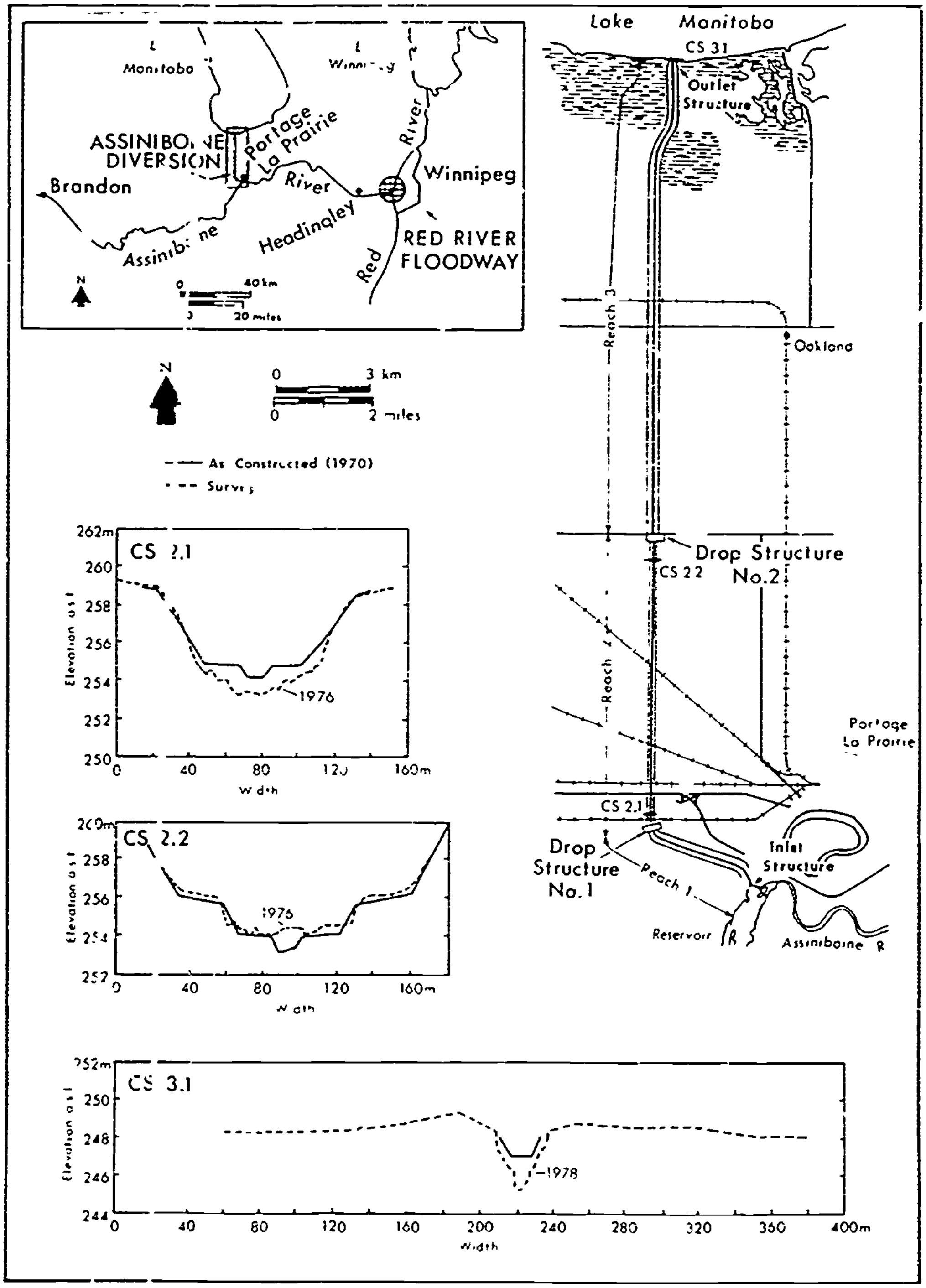
DESIGNING VELOCITIES

The preceding empirical equations indicate that most of the geomorphic responses in flood-control channels result from an imbalance between discharge and sediment load.

The ability to transport sediment depends on stream power (equation 6) and unit stream power is proportional to the product of depth, slope and velocity (equation 5). In designing flood-control channels one of the goals of hydraulic engineers has been to manipulate these variables so that the resulting flow would not yield excessive sediment load from channel erosion. One of the popular design criteria that has been used extensively to minimize erosion in man-made channels is the *maximum permissible velocity* or the *nonerodible velocity*, which 'is the greatest mean velocity that will not cause erosion of the channel body' (Chow 1959). Different values of allowable non-scouring velocities have been recommended for different types of channel materials, but one of the shortcomings of this method is that it is not practical to design velocities according to small-scale variations in channel materials. Thus, local variations in erodibility of channel materials may result in differential erosion from one section of the channel to another at a given velocity. Another shortcoming of this method is that the entire procedure is geared toward preventing scour and very little attention is paid to sediment routing and deposition (Nunnally and Keller 1979). Often grade control structures, such as weirs, are built to reduce velocities. These structures may induce local backwater effect resulting in aggradation behind them but degradation downstream from them, as the energy gradient from the backwater pool steepens over the weir. Aggradation may also be induced by backwater effect of the base level, such as a lake or an ocean, into which flood water flows. In particular, it is difficult to design permissible velocities if the base level fluctuates, as in a tidal environment. Inadequate consideration of this effect has resulted in accelerated aggradation (channel filling) and failure of the San Lorenzo River flood control project in Santa Cruz, California (Griggs and Paris 1982). The following case studies examine the problems of channel instability (accelerated degradation as well as aggradation) resulting from conventional design prodcedure.

CANADIAN CASE STUDIES

Conventional design procedure refers to the method of designing traditional flood-control channels - that have relatively straight alignments and trapezoidal cross-sections - according to the criteria of permissible velocities. The Assiniboine Diversion in Southern Manitoba and the Neebing-McIntyre floodway in Thunder Bay, Ontario are such conventional flood-control channels



The Assiniboine Diversion, southern Manitoba.

Selected cross-sections (CS) show examples of the nature of channelbed degradation and aggradation in different reaches of the floodway.

Figure 1

Assiniboine Diversion

The Assiniboine Diversion, a 29 km long floodway, which is one of the main components of the Red River flood-control system, was constructed by the Water Resources Branch (WRB) of the Manitoba Department of Natural Resources to divert flood waters from the Assiniboine River to Lake Manitoba and to provide flood protection to the cities of Portage la Prairie and Winnipeg and to the area adjoining the Assiniboine River between these two cities (Figure 1). Diversion of water from the river into the floodway is regulated by two control structures: a dam on the Assiniboine which impounds water in a 18000 dam^3 reservoir and a diversion inlet which permits discharges of the flood water from the reservoir to the floodway for its ultimate disposal into Lake Manitoba. The average slope of the land between the Assiniboine River and Lake Manitoba is 0.0007. To minimize potential erosion of the channel that has been excavated in glaciolacustrine materials of former Lake Aggassiz origin, the slope of the constructed channelbed has been reduced to between 0.00009 and 0.00026 by utilizing two concrete drop structures and an outlet structure. The maximum capacity of the main channel is 708 $m^3 s^{-1}$; whereas a low-flow subchannel, that carries a certain amount of water throughout the year, has a maximum capacity of 28 $m^3 s^{-1}$.

The project was completed in 1970. During 15 years of its operation (1970-84) the floodway has experienced considerable channel instability in the form of downcutting, bank erosion, aggradation and pattern changes. Most of these geomorphic changes have occurred in the exposed subchannel; the side slopes of the main channel have been protected with a thick cover of hardy grasses. Overall geomorphic responses of the floodway have been complex and varied from one section of the channel to another (Table 1). These can be interpreted in a qualitative way partly by using some of the functional relationships presented earlier and partly by examining the hydraulic characteristics of individual reaches.

Downcutting in reach 1 can be explained by equation 10. Release of relatively clear water from the reservoir into the diversion channel implies that the actual sediment load of the diverted flow falls short of its competence (stream power). This imbalance between stream power and sediment load is compensated by erosion of bed and banks, resulting in an increase in sediment load and a deepening and widening of the subchannel. Reach 1 is composed of silty clay material of glacial lake (Agassiz) origin, which has a recommended permissible velocty of at least 1 $m s^{-1}$ (Mishtak 1964), but erosion has occurred in this reach below this velocity (i.e. at 0.87 $m s^{-1}$). This is because the concept of permissible velocities applies only in regime channels after sufficient aging (Chow 1959). Erosion in

TABLE 1

PROBABLE EXPLANATIONS OF POST-CONSTRUCTIONAL CHANNEL CHANGES IN THE ASSINIBOINE DIVERSION, 1970-84

Channel changes and explanatory variables	REACH 1	REACH 2: Downstream from drop structure 1	REACH 2: Upstream from drop structure 2	REACH 3
Channel changes	Downcutting and minor widening of the subchannel	Downcutting and major bank erosion/ widening of the subchannel	Channel filling and braiding	Aggradation of the main channel but degradation of the subchannel
Average depth of degradation/ aggradation * ($cm\ yr^{-1}$)	8.8	14.33	-4.4	-5.1
Channel materials	Silty clay	Silt Sandy loam	Sandy loam	Silty clay, Silt loam
Permissible velocities** ($m\ s^{-1}$)	1 - 1.5	0.75 - 0.9	0.75 - 0.9	0.9 - 1
Average design velocities during peak flows (1974 & 1976 floods) ($m\ s^{-1}$)	0.87	1.1	1.1	0.6
Backwater effect	No significant backwater effect of drop structure 1	No backwater effect	Backwater effect of drop structure 2	Backwater effect of Lake Manitoba
Functional relationships	Equation 10	Equation 5	Equation 5 & 8	Equation 5, 8 & 2

* Negative sign indicates aggradation

** Recommended by the Special Committee on Irrigation Research of the American Society of Civil Engineers (Chow 1959, 196) this reach can, thus, be interpreted as a negative feedback mechanism prior to achieving its equilibrium state between sediment load and channel morphology.

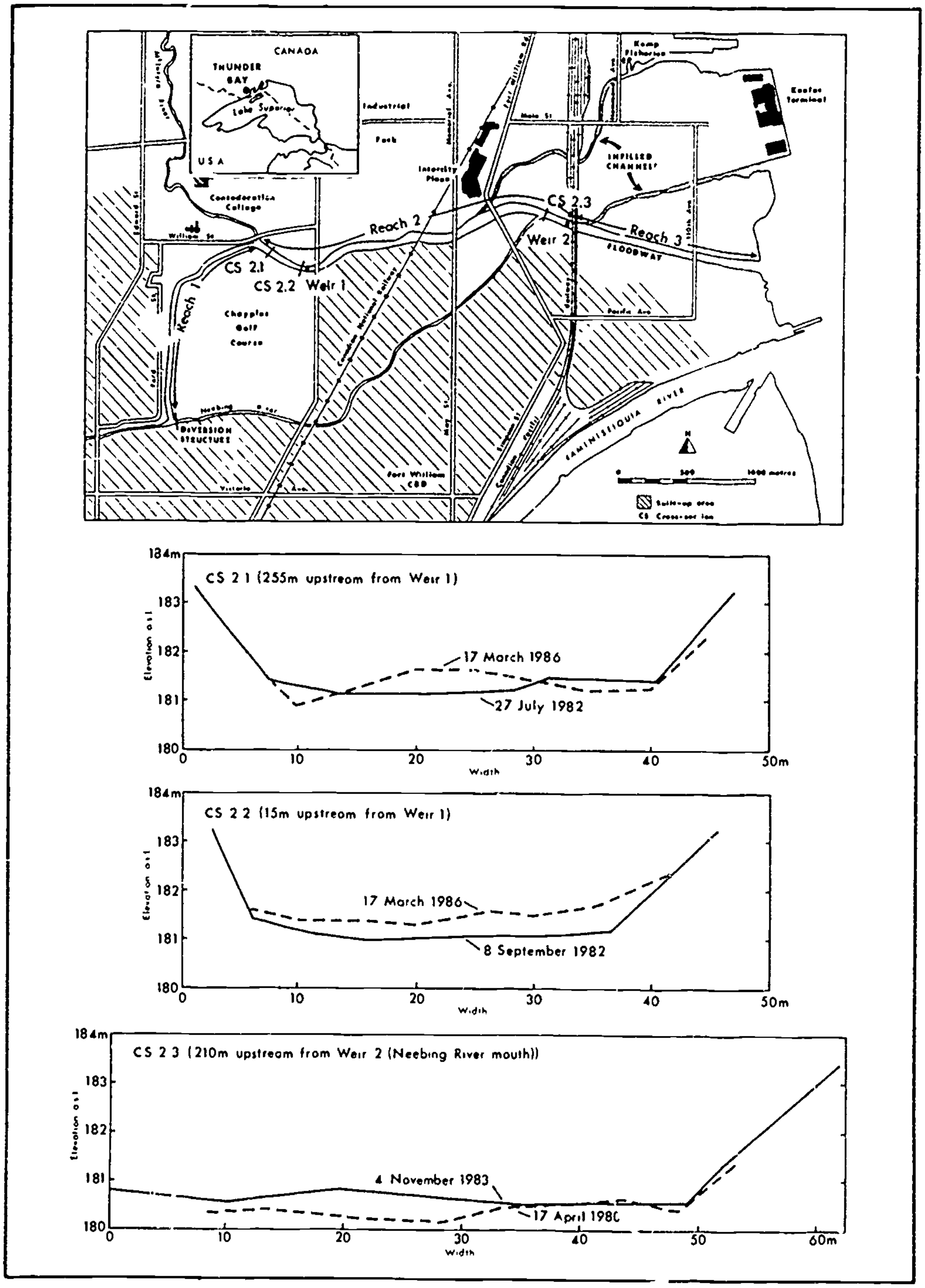
More complex changes have occurred in the middle reach. Accelerated downcutting and bank erosion of the subchannel downstream from drop structure 1 (typified by CS 2.1, Figure 1) can be explained by the effect of increased stream power, as the energy gradient steepens over the drop structure (equation 5). Channel materials of this reach, i.e. silt and sandy loam, are also more erodible than silty clay materials. The origin of such sandy materials in a general environment of glaciolacustrine silty clay deposits can be traced back to the superimposition of fluvial deposits in this section by a post-Lake Agassiz stream channel (palaeochannel). The designers of the floodway identified these deposits by pre-constructional soil tests (WRB 1966 and 1979). Yet it seems that allowable velocities in this section have been inadequately designed without considerations for the erodibility of channel materials, as the average velocities during 1974 and 1976 floods exceeded the recommended permissible velocitiies for sandy materials (Table 1). Most of the bedload eroded from this section has been deposited upstream from drop structure 2 in the form of a number of channel bars. According to equation 8, an increase in bedload (Q_{sb}^{+}) at a constant water discharge (Q_w^{o}) may result in a decrease in depth (d^{-}) and an increase in width/depth ratio (w/d^{+}), both of which are typical characteristics of a braided reach. The effect of increased bedload on slope cannot be assessed in this section according to equation 8 due to the backwater effect of the drop structure, which reduces energy gradient and decelerates flow velocities inducing loss of stream power (equation 5). Thus accelerated aggradation (channel filling) of the subchannel upstream from drop structure 2 (CS 2.2, Figure 1) can be attributed to this dual effect of increased bed load and reduced stream power.

The lowermost section of the floodway near its outlet (lower 5 km of reach 3) has experienced a unique combination of aggradation of the main channel and degradation of the subchannel (CS 3.1, Figure 1). This section has two distinct hydraulic characteristics: (a) relatively low energy gradient (0.00009) and design velocity (0.6 m s^{-1}) and (b) significant backwater effect of Lake Manitoba during high flows. Consequently, the stream power of the flow falls short of its actual load during high discharges. This has led to accelerated aggradation and a decrease in depth of the main channel. According to the continuity equation (equation 2) the loss of cross-sectional area (due to deposition) is compensated by an increase in velocity during low flows and the resulting degradation of the subchannel.

Neebing-McIntyre Floodway

The Neebing-McIntyre floodway in Thunder Bay, Ontario, a 5.4 km long flood-control channel, was constructed in 1981-83 to divert floodwaters from the combined watersheds of the Neebing and the McIntyre Rivers into Lake Superior (Figure 2). The uppermost section of the floodway (reach 1) is a 'dry' grassed channel into which floodwater is diverted from the Neebing when its peak flow exceeds 28 $m^3 s^{-1}$. The middle reach (reach 2) has been constructed through a former section of the McIntyre River. The lower reach (reach 3), downstream from the junction of the floodway with the Neebing River, is a straight trapezoidal channel that has been excavated through post-glacial lacustrine and fluvial deposits. All three reaches have a constant invert slope of 0.0005.

The floodway has been designed to carry the 175-year regional storm flow of 284 $m^3 s^{-1}$. One of the main hydraulic characteristics of this floodway is the backwater effect of Lake Superior which extends up to the confluence of the dry channel and the McIntyre River (that is the uppermost point of reach 2). Consequently, the designers of the floodway (Proctor & Redfern 1978) paid greater attention to its sedimentation problem, without any major considerations for its erosion potential. Two submerged sediment control structures (1 - 1.1 m high weirs) have been built at the transition points between reaches to reduce velocities and to trap sediments delivered to the floodway by various flow events. However, the designers' estimate of sediment accumulation - 54,500 m^3 during the regional storm and 5,200 m^3 during 2-year floods (Proctor & Redfern 1981) - seems to be exaggerated. Post-constructional surveys in 1984 and 1986, conducted by the Lakehead Region Conservation Authority, the agency responsible for managing the floodway, indicate an average annual accumulation of only 1500 m^3 between the two sediment traps (Figure 2). Another explanation for such a low rate of sedimentation lies in relatively dry open-water seasons and low flows (<5-year floods) during the period of operation (1983-86). Paradoxically, at such low flows the channel has experienced moderate to minor erosion at selected sites (Table 2). This can be explained principally by local steepening of the energy gradient at these sites due to certain hydraulic characteristics of the channel. For example, the steepest energy gradient is experienced at the junction of the upper and the middle reaches (that is at CS 2.1) because of a sharp drop in the invert slope between these two reaches. The permissible velocities for this section are exceeded significantly even by a 5-year flood (Table 2), implying a high erosion potential during larger flow events. However, armouring of the channelbed by riprap has prevented major downcutting and only minor degradation has occurred along the bank slopes (Figure 2, CS 2.1).



The Neebing-McIntyre floodway, Thunder Bay, Ontario

Selected cross-sections indicate the nature of channelbed degradation and aggradation between two sediment traps (weirs).

Figure 2

Channelbed erosion at CS 2.3 can be attributed to velocity acceleration at the mouth of the Neebing River.

In general, erosion potential for this floodway appears to be high during larger flow events, in particular during the regional storm; due not only to its relatively high design velocities in all reaches but also to the erodibility of bank materials. Soil tests of bank materials by the present author indicate that their composition range mainly from alluvial silt to sandy loam, which have relatively low permissible velocites (0.75 - 1 m s^{-1})

DESIGNING MEANDERING CHANNELS

Morphologic instabilities in both of these channels have one common characteristic: they have been instigated at most of the reaches by spatial variations in energy gradients from one specific site to another. Generalized design using the permissible velocity procedure usually does not pay adequate attention to such site-specific variations in energy gradients. In designing stable alluvial channels consideration should be given to simulating the diversity of energy gradients of natural streams from one section of the channel to another, since energy gradient is an important component of stream power that determines the ability to transport sediment. The best way to diversify energy gradients is to construct meandering alignments because these induce convergence and divergence of flows around their bends. In a straight channel there is no 'natural' control of flow direction and the bed sediments move erratically according to the magnitude and duration of flow (Winkley 1983). In meandering channels the pattern of sediment routing and storage is consistent with flow convergence and divergence, which result in systematic development of such bedforms as pools, riffles and point bars. Consideration of meandering and its associated bedforms in flood-control channel works should, thus, be encouraged whenever feasible; not only because meandering channels are more stable than straight channels but also because they have more hydrologic and biologic diversity and are aesthetically more pleasing (Keller and Brookes 1983).

The design criteria for traditional flood-control channels, such as the Assiniboine Diversion and the Neebing-McIntyre floodway, have stressed hydraulic efficiency and cost factors. A straight channel with trapezoidal cross-sections provides an efficient conveyance of flood water and requires the minimum right-of-way width, thus reducing the costs of land acquisition and excavation. In many cases the availability of space is one of the main constraints of constructing a meandering channel. For example, the Neebing-McIntyre floodway has been excavated through an urbanized area with valuable real-estate properties on both banks of the channel. The Assiniboine Diversion has been constructed in a rural area, where land is more readily available, but the acquisition of additional land would increase the cost of the project. To minimize the cost of land acquisition and excavation, Keller (1975) has suggested a compromise: the channel plan of a flood-control project should include the construction of a smaller meandering pilot channel (i.e. low-flow subchannel), which could be superimposed on a larger and straighter flood-control channel. The purpose of the subchannel is to concentrate discharges during low to moderate flow conditions but its use could be diversified by constructing pools and riffles which provide a variety of water depths and flow conditions that are needed to maintain biologic diversity and vigour (Nunnally and Shields 1985).

CONCLUSION AND PLANNING IMPLICATIONS

Another probable reason why a meandering channel plan is not considered in most of the conventional flood-control projects is the failure to realize the relevance of such a plan in channel stability. In particular, the concept of a meandering alignment for a floodway or that of a meandering subchannel within a straight main channel had not been advanced as a design criterion until the 1970s. For a while it was thought that environmental awareness conflicts directly with river engineering. With the emergence of a new philosophy of 'working with the energy of the river' this conflict has partly been resolved. This philosophy is based on emulation of natural forms and processes of meandering channels, since most of the natural streams attempt to minimize and equalize their energy expenditures by becoming more or less sinuous according to the slope of their energy plane (valley) (Winkley 1983). In West Germany this philosophy has been adopted in the *natural river engineering* technique which has been applied successfully in flood-control projects in the Ruhr Valley and in Bavaria (Keller and Brookes 1983; Londong 1986). In the United States, a similar technique, termed *stream restoration* or *stream renovation*, has been applied for restoring flow efficiency and controlling bank erosion and sedimentation problems in small urban streams by preserving meanders and river-bank vegetation in conjunction with other standard bank protection measures (such as placing riprap) (Nunnally 1978; Nunnally and Keller 1979). This technique has been used successfully in Charlotte, North Carolina, during the past twelve years (Nunnally 1987). In addition to the environmental benefits, stream reaches that were modified in 1976 have remained morphologically stable. Detailed guidelines for implementing this technique can be found in Nunnally and Shields (1985). Based on the positive experience with stable Charlotte channels and natural river engineering projects in West Germany, it may be concluded that properly-designed flood-control channels not only can satisfy the hydraulic and hydrologic requirements of the intended projects but, at the same time, can minimize their morphologic instabilities and enhance the environment.

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TABLE 2

EROSION POTENTIAL OF THE NEEBING-MCINTYRE FLOODWAY

	REACH 1	REACH 2			REACH 3
		CS 2.1	CS 2.2 (weir 1)	CS 2.3 (confluence of the Neebing)	Near the outlet
Post-Constructional channel changes (1983-86)	Stable grassed channel	Degradation: 1.5 cm yr^{-1} Aggradation: 4 cm yr^{-1}	Aggradation: 6.5 cm yr^{-1}	Degradation: 3-4 cm yr^{-1}	No significant degradation or aggradation
Channel materials	grassed channel	Alluvial silt	Alluvial silt	Sandy loam	Peat
Permissible velocities ($m\ s^{-1}$)	>1.5	0.9 - 1	0.9 - 1	0.75 - 0.9	>1.5
Design velocities at 2-year flood	0.74	0.75	0.34	0.50	0.33
Design velocities at 5-year flood	1.00	1.23	0.59	0.81	0.55
Design velocities at 175-year regional flood	1.43	1.96	1.41	1.95	1.71
Erosion potential	Low	High	Low	High	Low

AN EXPLORATORY STUDY OF BANKRUPTCY AND ITS ECOLOGICAL CORRELATES IN NORTH DAKOTA

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ABSTRACT. Bankruptcy is examined as an indicator of economic stress within a community. The geographic distributions of North Dakota county bankruptcy rates per thousand population for 1985, 1986, 1987, and the average rates for the three year period are presented. A correlation analysis is performed seeking relationships between sixteen environmental variables and the four bankruptcy rates in an attempt to explore the nature of the ecological setting in which bankruptcies occur in North Dakota.

INTRODUCTION

While the economy of the United States has undergone a period of considerable expansion during the 1980's, the economy of North Dakota has been affected by a "roving" recession. This economic circumstance reflects that while certain sectors of the national and various state economies have prospered, other parts have failed to follow suit. Most noteworthy among those sectors suffering from a lack of prosperity are agriculture and petroleum. These primary economic activities have been characterized by declining prices, continuing surpluses, and increasing restructuring of the productive units. Because agriculture and petroleum production are major activities within North Dakota's economy, contributing a combined average of twenty-seven percent to gross state product from 1980 to 1983, any recession within these sectors implies recession for the larger economy of the state (Kauffman and Uyar, 1985:27).

Bankruptcy, an important measure of the economic stress that is related to the roving recession within the North Dakota economy, is the inability of individuals and businesses to pay debts owed to creditors. This paper is an examination of the bankruptcy problem in North Dakota. It has two immediate goals: (1) to describe the geographic distribution of bankruptcies in North Dakota, and (2) to test various hypotheses concerning potential environmental correlates of these bankruptcies. The long-range goal of this paper is to contribute to the understanding of North Dakota's political system and the nature of any East-West division within that system. Bankruptcy is to be pictured as an economic factor which might have political effects. The underlying assumption is that economic stress breeds political stress. Bankruptcy is certainly a major economic and social trauma that may show some relationship to political behavior. By examining this North Dakota bankruptcy case study, future political geographic research may benefit from this presentation's conclusions about such a potentially significant indicator of total statewide stress.

BANKRUPTCY: NOTES ON ITS CHANGING IMPORTANCE

The significance of bankruptcy has changed over time. Smith (1988 : 200) notes that while bankruptcy laws have existed at the national level since 1898, it has been only since 1960 that bankruptcy filing has become commonplace. The lack of the following often is cited as reason for this paucity of activity: credit, lawyers willing and able to handle bankruptcy cases, and ability within the bankruptcy system to halt foreclosures under local jurisdiction (Smith, 1988: 200-201). As these factors have changed over time, bankruptcy has become increasingly important as a financial vehicle for solving debt-related problems. Smith (1988: 20_) notes that while 52,320 bankruptcies were filed in 1940, the number had grown to 100,034 by 1960, 194,399 by 1970, and 277,880 by 1980. This figure rose to 561,278 in 1987 (Smith, 1988: 201).

The Bankruptcy Reform Act of 1978 provides for bankruptcies under chapters seven, eleven, and thirteen. This act was ruled unconstitutional in 1982 because it failed to give bankruptcy judges lifetime tenure and salary protection as required by the U.S. Constitution (Gelman, Ma, and McDaniel, 1984). The Bankruptcy Amendments Act of 1984 solved the tenure and salary problems, but altered a number of specific rules (Wantuck, 1985). The Farm Bankruptcy Act of 1986 provides a special category for farm bankruptcies under the heading of chapter twelve. Each of these chapters has a specific purpose and the results of each will be different as they are applied under differing circumstances to solve the problems of creditors and debtors. The impact of each of these on the extended community will also vary given their natures with respect to debt discharge, the standing of the bankrupt individual or entity following filing, or the level of protection afforded each of the sides.

Chapter seven bankruptcies have as their goal the liquidation of property of the bankrupt individual or entity and the payment of debts from the proceeds. It often is referred to as "straight bankruptcy" given its clear intention to solve the problem of unpaid debt in the shortest possible fashion. Any person, synthetic or actual, can file for a chapter seven bankruptcy with minor exceptions: railroads, banks, savings and loans, homestead unions, and credit unions (Herzog, 1983: 20-30). Filings under chapter eleven have as their goal the reorganization of a business, but also may be used by individuals with debts not meeting the limits of the chapter thirteen type. Chapter thirteen filings involve individuals and sole proprietorships where the bankrupt individual or entity has current income. Small companies are allowed to file, too, if they are sole proprietorships. This category also has a debt ceiling of $100,000 to $350,000, depending upon the nature of the debt involved. It is intended to assist people of the middle-income classes who have financial problems (Herzog, 1983: 33). Chapter twelve filings are limited to farm-related bankruptcy situations. There are limitations on the total debt involved and a reorganization plan must be filed within 90 days (Smith, 1987:40; 1988:202-203).

State laws will have some impact upon filing rates and related items,too. One discussion examining the variation in chapter twelve filing rates among South Dakota, North Dakota, Nebraska, Kansas, Iowa, and Minnesota suggested that the strength of bankers associations, the existence of mediation procedures for use prior to bankruptcy filing, the nature of foreclosure laws, the impact of political tradition, or the stage within the "downtrend in agriculture" might influence filing rates (Pates, 1987).

LITERATURE REVIEW

Study of the bankruptcy issue is rather limited outside of those materials involving case details intended for lawyers and others involved in the legal process of bankruptcy. The materials available can be divided into three categories: items for legal counseling use, general media coverage, and studies of bankruptcy and its effects.

Legal Counseling Materials. These documents are aimed at the legal community or offer specific advice intended as counseling for those with an interest in or contemplating bankruptcy (Herzog, 1983). Such materials cover specific legal positions or provide the information necessary to participate in a bankruptcy proceeding.

General Media Materials. Such items focus on either the rise in or personal effects of bankruptcy filings in a general fashion or they cover specific political-judicial actions related to the bankruptcy issue. Given the nature of economic problems within the United States over the last decade, the first type can be subdivided into those materials looking at bankruptcy in general and those related to the farm crisis.

Non-farm related examples of the first category are articles that present an example of a non-farm family with the potential to meet the requirements of the bankruptcy law concerning filing. The route of the family through the process is followed and alternatives are presented (Condor, 1986). In other cases, coverage may not focus upon a specific family, but the identification of specific bankruptcy categories may be discussed (Schiffres, 1986).

Farm related examples of the first category result from the farm crisis of the 1980's. As with the previous materials, coverage may focus upon a single family and its specific troubles (TIME, 1986) or treat the crisis in general terms with individuals mentioned only to exemplify specific bankruptcy-related problems (Davidson, 1986). As the farm crisis has assumed importance beyond the normal significance of bankruptcies, it is interesting to note that motion pictures such as Country and The River have taken the bankruptcy-foreclosure problem (Long, 1987 : 49) and presented its trauma to the public with greater emotional power than conveyed by normal print-media channels. Given the wide circulation of films such as these, it is important to give them notice because of the impact they may have on the general public's perception of the bankruptcy problem.

The second category includes those materials which have followed the political and judicial actions involved in the creation of bankruptcy law through the normal political and judicial process. These materials may cover the specific lobbying, congressional, and judicial events that have resulted in bankruptcy law changes (TIME, 1984; Business Week, 1984; Gelman, Ma, and McDaniel, 1984) or they may offer speculative thoughts on potential problems related to those changes (Becker, 1986; Wantuck, 1985).

Studies of Bankruptcy and its Effects. These materials discuss the bankruptcy problem from several perspectives. Foci for concern are bankruptcy effects in general, in relation to the farm crisis, and in respect to political-economic organization. Study of the effects of bankruptcy in a general fashion appear rather limited. Stanley and Girth have provided wide coverage of the nature of bankruptcy filers and the effect of bankruptcy filings on the larger community (1971). However, their work depends upon survey results obtained during the 1960's. Given the legal changes outlined earlier, results from that time period may be subject to question when applied without reason to current events.

Bankruptcy issues and effects, directly related to agricultural concerns, have received media and scholarly attention given the national significance assigned to the farm crisis. Such materials may cover changes in filing rates (Pates, 1987) or specific aspects of farm bankruptcy problems such as avoidance of liquidation (Successful Farming, 1986). Of special note is the work of Smith (1987; 1988) whose coverage of the growth of farm bankruptcies during the farm crisis has focused on North Dakota. His main concern has been to use bankruptcy as an indicator of the farm crisis, noting that the crisis has brought a corresponding rise in bankruptcy filing rates (Smith, 1987:45). This analysis of the general bankruptcy problem within North Dakota noted that the percentage of bankruptcies in state planning regions containing metropolitan statistical areas has declined between 1978 and 1984 (Smith, 1987: 43). Further analysis showed that from 1970 to 1984 there was a trend toward increasing bankruptcy filings from places with populations under 10,000; So Smith speculated that certain agriculture-related problems were correlated with these changes (Smith, 1987: 45-47).

A special category of farm-related materials are those which look at the effects of the farm crisis on individuals, families, and rural communities. Heffernan and Heffernan (1986) surveyed Missouri farm families with the goal of documenting the emotional effects of the farm crisis on those families. They found community effects ranging from the expected loss of agribusiness firms, given the uncollectable debt owed these firms, to loss of active community leaders and participants as farm families cease to be active locally when under the stress of economic problems (Heffernan and Heffernan, 1986: 162, 165-66). In a similar study, Pooyan (1987) surveyed North Dakota farmers looking for behavioral effects of farm-related stress.

Studies concerning the nature of agricultural operations within the political-economic setting of the United States also have relevant messages concerning bankruptcy, although bankruptcy may not be a specific focus or topic of interest in these materials. The long-term effects of bankruptcy are discussed, but only in terms of the changes they will bring in American community life as the number of farms declines or as changes occur in farm-ownership patterns. The Goldschmidt thesis, that there is a clear relationship between the structure of farm operations and the quality of life in rural communities, is an issue discussed in Vail (1982), Vogeler (1981), and Madden and Baker (1981). The implication is that a further decline in farm numbers and an increase in corporate ownership of farms will bring a decline in the quality of life in rural communities. This fate is a long-term result of farm bankruptcies which reduce the number of farms.

METHODOLOGY AND DATA

The data for this study came from the Fargo Forum which has weekly listings of bankruptcies filed in the United States Bankruptcy Court-North Dakota District. The information thus obtained was the name(s) of the bankrupt, address, liabilities, assets, and bankruptcy chapter. The publication date was used as a substitute for the actual filing date. This introduces a slight level of error in that cases filed during the last week or two of a year may not be published until the next year. The total amount of error introduced was considered negligible for the purposes of this study. It should be noted that all published filings included the name of the bankrupt, but the other data present did vary. As chapter identification has no significance in this study, its lack was not considered of importance. Less than one percent of the filings were listed without an address. The lack of an address eliminated a filing from the data base, but given the extremely small number of filings in this situation, this was not considered a significant problem.

The data was processed to provide counts of the number of filings per year in each North Dakota county. To make the county figures fully comparable, the number of bankruptcies per thousand population was determined. For summary analysis of the 1985-1987 period as a whole, the yearly figures were averaged to provide the yearly average number of bankruptcies per thousand population. In these computations the four types of bankruptcy were summed and considered equal within the data. This is justified in this study because the goal is to evaluate the level of economic stress placed upon a county and not the effects of specific types of bankruptcies. While there are likely differences in the effects of various types of bankruptcies upon a community--for example, a chapter seven filing by an individual may involve much less debt and a different mix of creditors than a chapter twelve farm bankruptcy, hence the impact upon the community may be different--the view taken of the bankruptcy process in this paper is that bankruptcy has a psychological impact which ultimately can be connected to political behavior in the future.

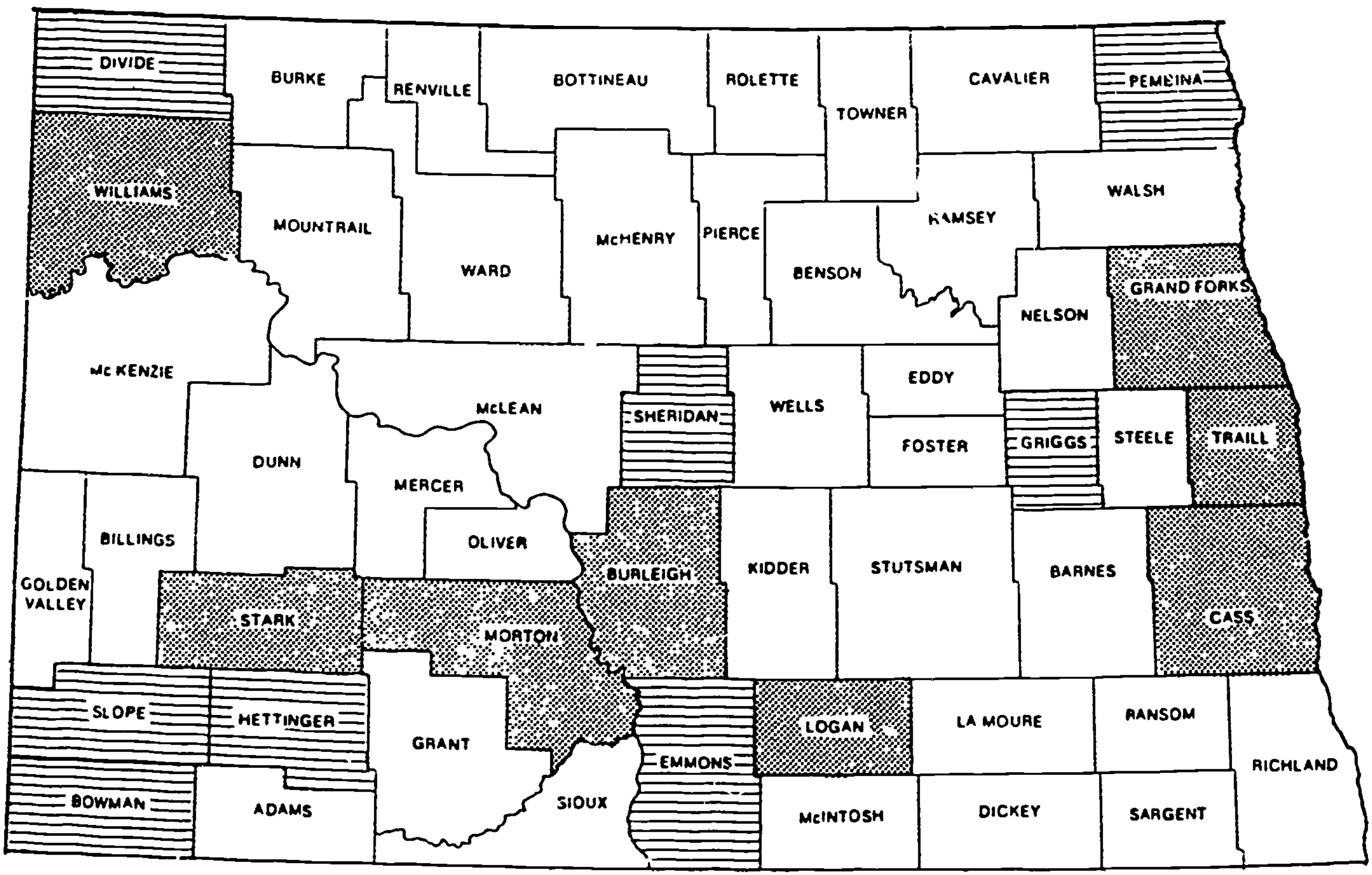
The figures, calculated as described above, show a bankruptcy problem that has worsened during the three-year period. The mean bankruptcy rate per thousand population increased from .839 in 1985 to 1.355 in 1986 and 1.383 in 1987. The highest bankruptcy rate for any county also increased during the period, starting at 1.857 per thousand in 1985 and increasing to 3.457 in 1986 and 3.764 in 1987.

An examination of the data using maps success six provocative findings (see Fig. 1, Fig. 2, Fig. 3, and Fig. 4):

1. Looking at the 1985, 1986, and 1987 maps individually, Burleigh and Stark counties had bankruptcy rates one standard deviation or more above the mean in all three years (Fig. 1, Fig. 2, Fig. 3). This tends to indicate bankruptcy is a continuing problem in these counties. Speculatively, this can be explained as an effect of the decline in oil prices.
2. The western counties display erratic behavior through the period, but groupings of counties southwest of Burleigh appear on each of the maps. Again, the oil-price crisis is a likely factor. Illustrating this item is the fact that Slope county had the highest bankruptcy rate in the state in 1986 (3.457) but had no bankruptcies in 1985 and 1987.
3. The Red River Valley counties had three members in the one standard deviation above the mean category in 1985, but none in 1986 and 1987. This again suggests a worsening situation in the west.
4. Foster county in 1986 and 1987, joined by Eddy, Benson and Wells in 1986, displayed a bankruptcy rate that is one standard deviation or more above the mean. Indeed, this record becomes more glaring when one notes that Foster County is the only county east of Burleigh to have had a bankruptcy rate one standard deviation or more above the mean in 1987.
5. The map displaying the yearly average number of bankruptcies for the three year period shows a slightly reduced western bias, especially compared to the 1987 map (Fig. 3). The eastern counties of Cass, Foster, and Eddy provide a balance to the troubles of Adams, Billings, Stark, Morton, Burleigh, and Williams.
6. The summary (Fig. 4) shows comparatively low rates of bankruptcy in several counties around Burleigh and along the northern border of the state.

The above observations provide an impetus for further geographical examination of North Dakota's economic climate. The next section of this paper presents statistical evidence of the relationships which might be postulated about these distributions.

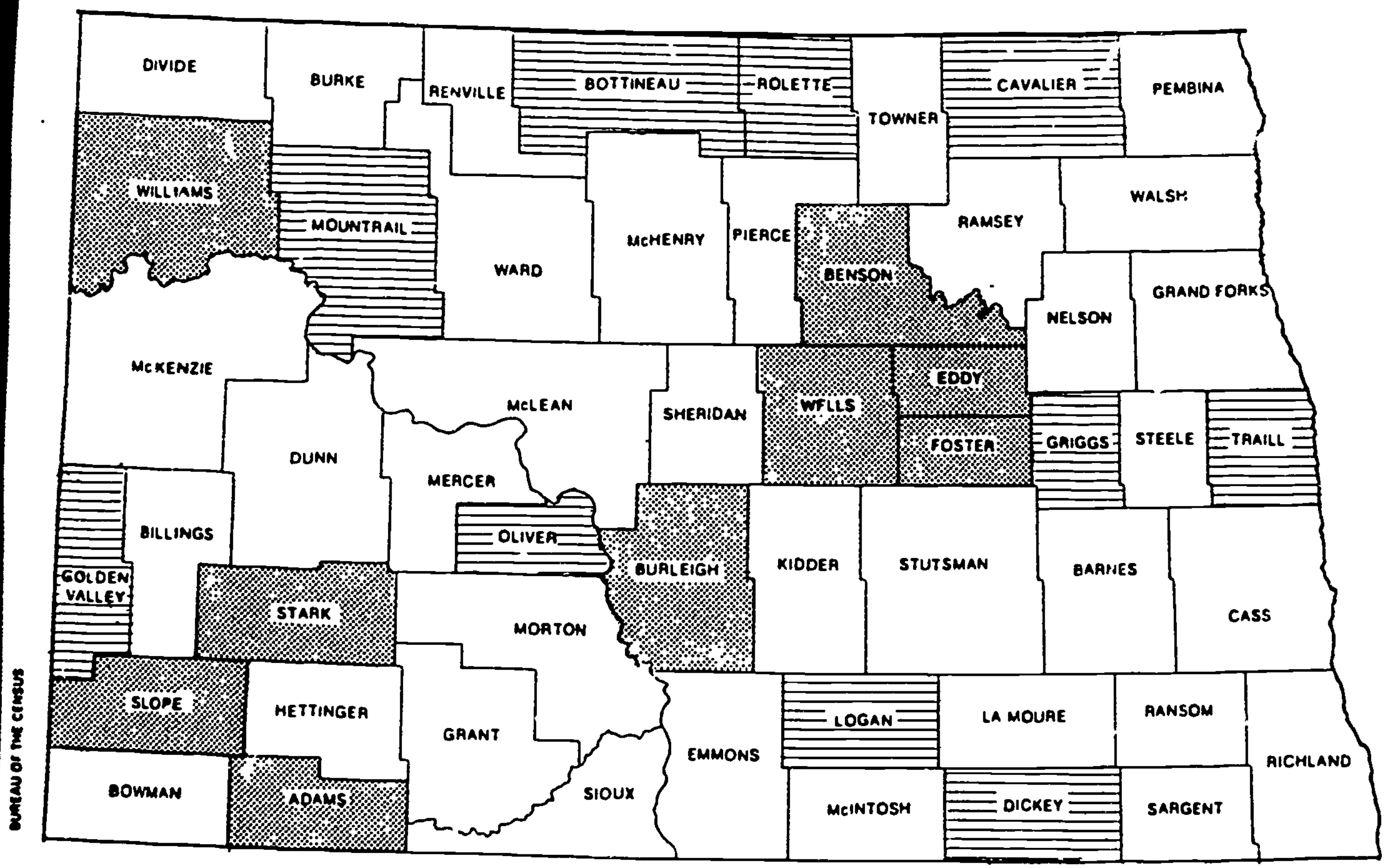
FIGURE 1. BANKRUPTCIES PER THOUSAND POPULATION: 1985



BANKRUPTCIES PER THOUSAND POPULATION: 1985

0 - .37 (GREATER THAN 1 STD. DEVIATION BELOW MEAN)
.41 - 1.31 (WITHIN 1 STD. DEVIATION OF MEAN)
1.35 - 1.86 (GREATER THAN 1 STD. DEVIATION ABOVE MEAN)

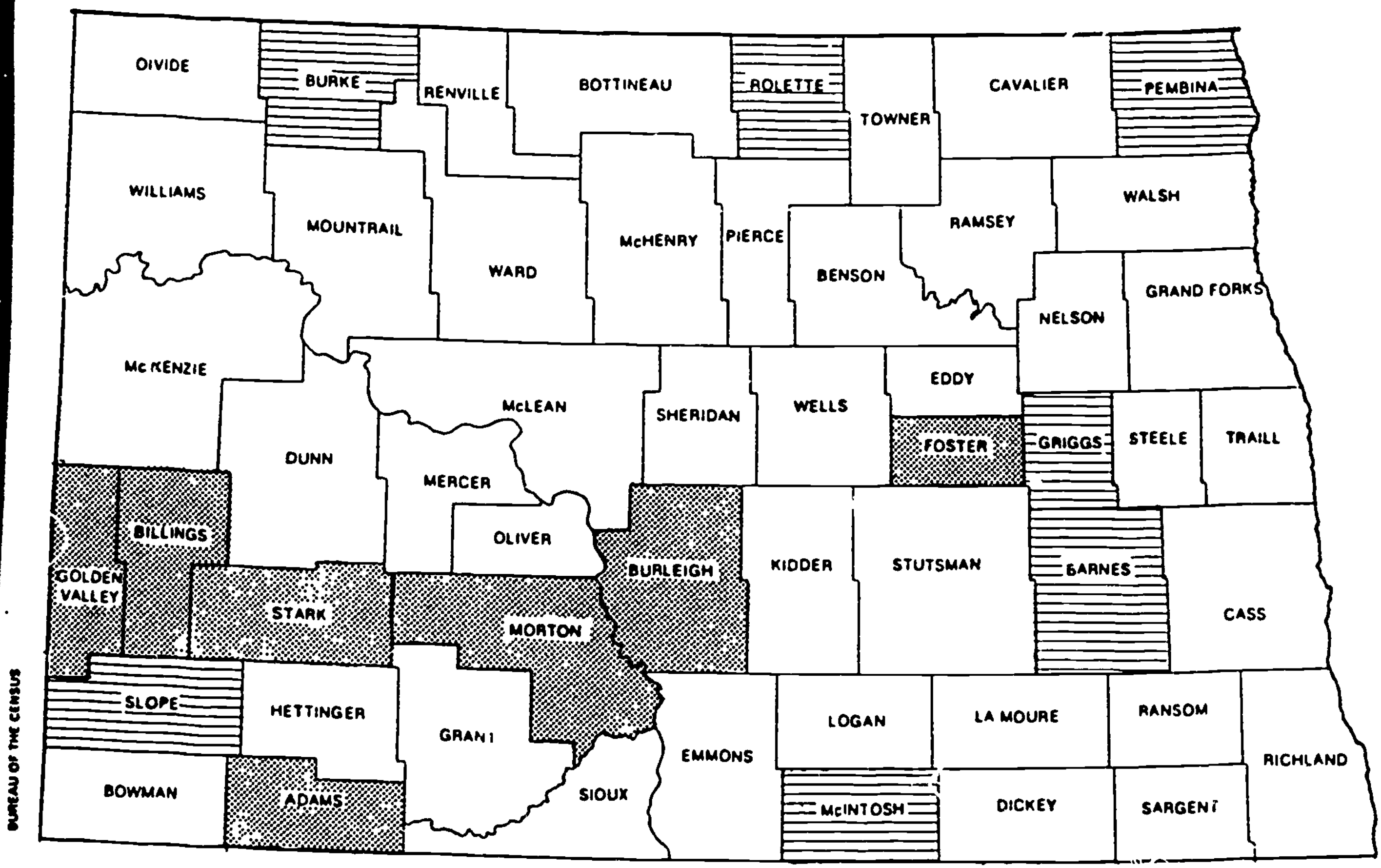
FIGURE 2. BANKRUPTCIES PER THOUSAND POPULATION: 1986



BANKRUPTCIES PER THOUSAND POPULATION: 1986

[horizontal lines]	0 - .56	(GREATER THAN 1 STD. DEVIATION BELOW MEAN)
[blank]	.57 - 2.1491	(WITHIN 1 STD. DEVIATION OF MEAN)
[shaded]	2.1493 - 3.46	(GREATER THAN 1 STD. DEVIATION ABOVE MEAN)

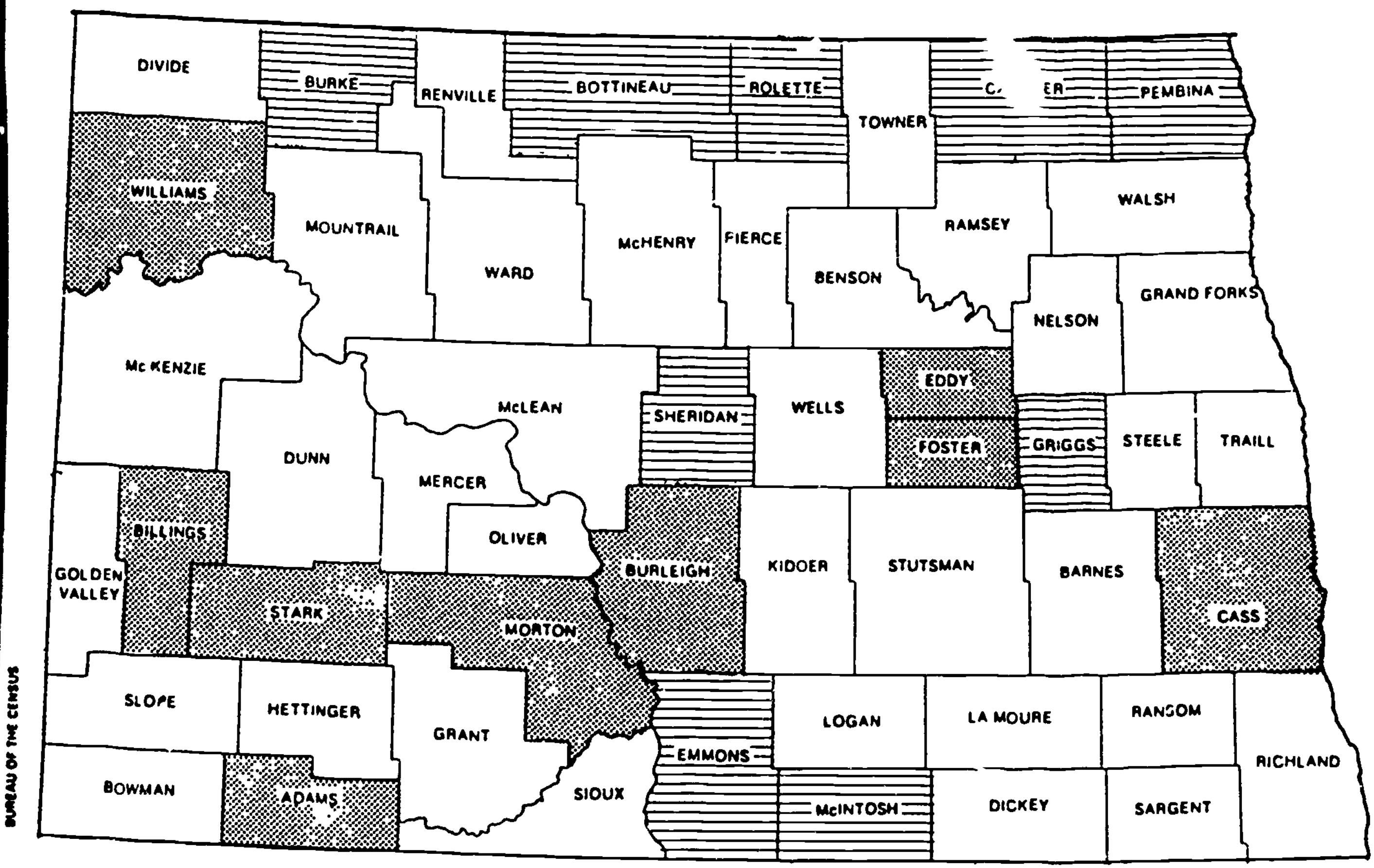
FIGURE 3. BANKRUPTCIES PER THOUSAND POPULATION: 1987



BANKRUPTCIES PER THOUSAND POPULATION: 1987

[horizontal lines]	0 - .60	(GREATER THAN 1 STD. DEVIATION BELOW MEAN)
[ ]	.68 - 2.16	(WITHIN 1 STD. DEVIATION OF MEAN)
[stippled]	2.23 - 3.76	(GREATER THAN 1 STD. DEVIATION ABOVE MEAN)

FIGURE 4. YEARLY AVERAGE NUMBER OF BANKRUPTCIES PER THOUSAND POPULATION: 1985-1987



YEARLY AVERAGE NUMBER OF BANKRUPTCIES PER THOUSAND POPULATION: 1985-1987

(horizontal lines)	.26 - .70	(GREATER THAN 1 STD. DEVIATION BELOW MEAN)
[ ]	.78 - 1.683	(WITHIN 1 STD. DEVIATION OF MEAN)
(shaded)	1.688 - 2.24	(GREATER THAN 1 STD. DEVIATION ABOVE MEAN)

HYPOTHESES AND THEORETICAL DEVELOPMENT

Given the patterns of bankruptcy examined above, the next step is to seek an understanding of bankruptcy as part of its larger, but still local, setting. We cannot connect bankruptcy filing rates to characteristics of the individual bankrupt because such data are not available. However, we can note the characteristics of the larger local environment which seem statistically related to the incidence of bankruptcy filing in the community. By so doing, we are attempting to identify characteristics which are common to areas with important bankruptcy problems and those characteristics which are not. Consequently, the nature of bankruptcy as a factor within those communities and its effect on their behavioral patterns can be understood better.

From a theoretical perspective, the position of bankruptcy in a local system can be seen as a measure of stress. The simplest view of bankruptcy is that it is a sign of failed economic planning or activity, but it can be elevated to the position of being an indicator of stress, if it is assumed that economic failure is a stressful situation. Logic and the current evidence support this assumption (Heffernan and Heffernan, 1986; Pooyan, 1987). Picturing the local system, the external environment influences local conditions and can have an important impact on bankruptcy rates. For example, farm bankruptcies cannot be separated from national farm policy and economic conditions. External factors are injected into the local system along with signals generated inside that system. Within the local system, bankruptcy is both a measure of stress and a particular action. It identifies stress at specific points and signals stress to the remainder of the system. Bankruptcy also occurs as other system variables produce stress or signals. Stress within the system and any effects on that system occur as it responds to the signals thus generated. Bankruptcy is seen as having an implicit position within the local system from which it cannot be separated. Causality is circular, with bankruptcy causing action and action causing bankruptcy. The goal of the following analysis is to identify those variables which measure characteristics of the local system which might interact with bankruptcy. We seek signals or signal paths within the local system rather than direct causality.

Sixteen variables were selected for correlation with the average bankruptcy rates during the 1985-1987 period in North Dakota and with the rates for each of the individual years during that period. The following paragraphs describe the variables and provide a brief statement of their hypothetical relationships to bankruptcy rates. At the outset of this procedure it should be noted that the relationships explored seek explanations of the environments in which bankruptcies occur. The individual or entity bankrupt and their characteristics are not the target of this analysis given the aggregate data involved.

Variable 1. That a population has a potential positive relationship to bankruptcy rates was found by Smith, although he noted a trend towards increasing numbers of bankruptcies in those North Dakota counties with smaller populations. (1987 : 43) Several potential explanations exist concerning the relationship between higher populations and bankruptcy rate. The place with a small population is at an economic disadvantage, if only because it has fewer consumer; and its businesses are often in a poor competitive position, where cost and price are concerned, compared to places with more population. For this reason the county with a small population may not be seen as a good business location and it may not draw risk-taking entrepreneurs. An alternative explanation evolves from the evidence that businessmen in small centers may be more subject to feelings of alienation than their counterparts in larger centers (Photiadis, 1967:234). Alienation may promote less risk-taking behavior and suppress further entrepreneurship. In summary, both circumstances would result in lower bankruptcy rates in areas with smaller populations. Hence, the county populations for 1980 were used (Bureau of Business and Economic Research, 1983:9-10).

Variable 2. Population density has similar potential. Lower density environments will generate fewer customers and fewer opportunities. Bankruptcy rates may be lower because the environment does not foster risk takin' The population density for 1980 was used (Bure. of Business and Economic Research, 1983:14-15).

Variable 3. Smith (1987:43) suggested, without a correlation analysis check, that urbanism was related to bankruptcy rates. The urbanized environment marks a shift in the variety of opportunities available. The number of jobs and the number of business possibilities available is obviously larger. The more opportune environment likely presents more opportunities for bankruptcy at the same time. Consequently, the percentage of the population living in the United States census defined urban places in each county in 1980 was used (Bureau of Business and Economic Research, 1983: 9-10).

Variable 4. Smith (1987:38) noted that middle-age farmers who tried to expand their operations tended to be most prevalent among those farmers with debt/asset ratios above .7. These are the members of the farm community most likely to face bankruptcy filing. Given this age bias in data concerning one sector of the bankruptcy filing public, age bias should be a variable to include. The implied rationale, given the farm data, is that older populations will not be risk-taking populations. The risk of bankruptcy is thus reduced. Thus, percentage of persons age 65 or greater in 1980 was selected for this variable (Bureau of Business and Economic Research, 1983:20-21).

Variable 5. Migration will be used as a surrogate measure of the perception of opportunities. Places with high out-migration rates are perceived as having fewer opportunities than other places. Higher rates of bankruptcy should be found in places with recently declining opportunities. The out-migration rate for 1985 to 1986 was used for this variable (North Dakota Census Data Center, 1987a).

Variable 6. Educational attainment is a measure of the skills and capability base of a community. With the increasing complexity of modern economic life, lower levels of educational achievement imply a decreased ability to cope. This should lead to increased levels of bankruptcy since economic failure may be an important way that the inability to cope displays itself. Stanley and Girth (1971:42-43), in their study which used survey data from 1964, found personal bankruptcy filers had above average education and tended to be blue-collar workers. This conflicts with the view that lower levels of educational attainment should be related to increased levels of bankruptcy filing. However, it should be remembered that bankruptcy law has undergone serious changes since 1964 and that the North Dakota population would not be approximated by a clustered random national sample. For this variable, the percentage of the population eighteen years or older, who are without four years of high school, was used to measure educational achievement (Bureau of Business and Economic Research, 1983:509-510).

Variable 7. Regionalism is an important issue within North Dakota (Pedeliski, <u>et</u>. <u>al</u>. n.d.:8-11). Over time western North Dakota has made known its concerns versus eastern North Dakota. The data, as analyzed above, suggest a western bias during 1987, which is much reduced in the averaged figures and in 1985 and 1986. To test for this relationship, the number of miles from the southeastern corner of each county to the Red River was used as a measure of regionalism.

Variable 8. While poverty circumstances naturally suggest increased bankruptcy problems, it is equally likely that poverty areas may have less credit available, hence fewer bankruptcies. As a surrogate for poverty, variable eight was based on the average monthly percentage of the population receiving food stamps in 1982 (Dawes, Molvig, Hickok, 1983:121).

Variable 9. An alternative view of income and its effects on bankruptcy would be to measure the comparative change in income status during the 1980's. Bankruptcy might not be as much related to income as it is to the inability to maintain position on the income scale. A decline over a period of time may indicate an important local decrease in buying power. This may have a relationship to bankruptcy rates that is independent of actual income level. However, the percentage change in median family income from 1979 to 1988 was used to measure comparative position with respect to income (North Dakota Census Data Center, 1988b).

Variable 10. Minority status may have a relationship to bankruptcy rates. Given that Native Americans are the dominant minority group in North Dakota and that several reservations are located within the state, it is speculated that elevated levels of minority population will be related to lower rates of bankruptcy because of the lack of credit available to such persons. Stanley and Girth (1971:45), found a disproportionate number of Blacks filing for bankruptcy in 1964, but since the largest North Dakota minority group has a different societal position, the contrary view that minority status and lower rates of bankruptcy should be related is justified. Thus, the percentage of the population identifying themselves as Native Americans in 1980 was used to measure minority status (Daul, Rathge, and Goreham, 1986).

Variable 11. The purchasing power provided by employment opportunities in each county has a suggestive relationship to bankruptcy rates. This variable gives a view of the change during the 1980's in the ability of the average job to provide purchasing power. Absolute figures would not provide this perspective. Entrepreneurs have provided purchasing opportunities based upon their expectations of income generation in the community. If that income fails to develop, then those businesses may face bankruptcy. Consequently, the percentage change in wages per job from 1980 to 1986 as adjusted for inflation was used to measure purchasing power changes (North Dakota Census Data Center, 1988a).

Variables 12, 13, and 14 There are numerous measures that could be used to determine the nature of the business climate within a county. Such a measure is often a summary title for those characteristics which allow businesses to flourish. Here it is used in the sense of measuring outcome rather than environmental characteristics. Declining business climates, indicated by low or declining values on the measures below, should correlate with increased rates of bankruptcy filing. A farm related variable is included and may be of the greatest importance because of farm dominance in numbers over retail and manufacturing establishments. North Dakota had 36,431 farms in 1982 versus 19,282 retail establishments in 1984 and 586 manufacturing establishments in 1985 (North Dakota Census Data Center, n.d.; 1985;1987b). The ability of farm decline to impact the business climate should exceed that of retailing and manufacturing combined. So, three interconnected measures were used as surrogates for the business climate: the percentage change in the number of manufacturing establishments between 1980 and 1985 (North Dakota Census Data Center, 1987b), the percentage change in the number of retail establishments between 1980 and 1984 (North Dakota Census Data Center, 1985), and the percentage change in number of farms between 1978 and 1982 (North Dakota Census Data Center, n.d).

Variable 15. The oil industry has suffered from price and market problems during the 1980's so the expectation is that petroleum-producing areas will have higher rates of bankruptcy. Therefore average yearly oil production from 1979 to 1981 was used to measure the local significance of the petroleum industry (Bureau of Business and Economic Research, 1983:328-9).

Variable 16. In contrast to the oil industry, the coal industry has been relatively stable. Those areas with active coal mining should negatively correlate with bankruptcy rates. Consequently, the average yearly coal production for 1980 to 1982 was used to measure the local significance of coal production (Bureau of Business and Economic Research, 1983:323-324).

ANALYSIS

Five variables were found to have significant relationships (based on a decision rule of .05) with the yearly average bankruptcy rates per thousand population for 1985-1987 and with the rates for 1985 (see Table 1). Four of the relationships failed to maintain significance in 1986 and 1987. Eleven variables did not display a significant relationship with any of the four bankruptcy rates. This discussion now will focus on the five variables with significant relationships, followed by comments on selected items from the remaining variables.

Population has a significant positive relationship with the yearly average bankruptcy rates for 1985-1987 and the rates for 1985. This indicates that, for the 1985-1987 period and for 1985, bankruptcy tended to be a greater urban phenomenon than a rural one. The environments in which bankruptcy rates were higher were urban for these two periods. This confirms the tendency found by Smith (1987:43). The specific cause of this relationship deserves more detailed exploration. The two rationales speculated upon earlier were that the low population environment suffers from economic disadvantage and some individuals there may feel alienated. Both of these may depress new entrepreneurship, hence the lower bankruptcy rate. Places with larger populations may display these rationales in reverse. They may encourage business and generate bankruptcies as businesses compete and fail. It also should be noted that the relationship was not maintained in 1986 and 1987. This suggests that the relationship has broken down over time and implies an increase in the bankruptcy problem in lower population areas.

Population density has a significant positive relationship with the yearly average bankruptcy rates for 1985-1987 and the rates of 1985. This duplicates the findings for population. The difference between the two being that the density figures adjust the population figures for varying county size. The rationales for finding a significant relationship between density and bankruptcy were that the number of available customers would be lower and the opportunities for businesses would be reduced. Given the significant relationship found here, these items deserve further study.

The percentage of the population living in United States Census-defined urban places has a significant positive relationship with all four bankruptcy rates. The counties with more urbanized environments have higher rates of bankruptcy filing. While the urbanized place offers more opportunities for individuals and entrepreneurship, it seemingly provides more opportunities for bankruptcy too. Given the consistency of significance established by this variable, further research aimed at understanding the differences between rural and urban persons and firms with respect to bankruptcy should be undertaken.

The percentage of elderly persons in a county population has a significant negative relationship with the yearly average bankruptcy rates for 1985-1987 and the rates for 1985. As with population and population density, this relationship does not extend to 1986 and 1987. Given the earlier findings that middle-age farmers dominate the group of farmers with debt problems, it should be noted that this farm-related effect may have some impact on the summary counts of bankruptcy used here. In any case, environments with greater percentages of elderly people do tend to display greater stability and lower stress as measured by lower bankruptcy rates. Areas with higher percentages of elderly persons may have fewer persons taking risks, hence fewer bankruptcy filings. This assumes the general population follows the pattern set by farmers.

The percentage of the population over eighteen, and without four years of high school, has a significant negative relationship with the yearly average bankruptcy rates for 1985-1987 and the rates for 1985 and 1987. As the percentage of a county's individuals having less than four years of high school increases, the bankruptcy rate decreases. The relationship exists as predicted, but the direction is reversed. These results confirm the 1964 findings of Stanley and Firth (1971:42-43). However, the aggregate data of this study cannot be used to directly state that bankruptcy filers have higher levels of education. It can be concluded, however, that the environments having higher rates of bankruptcy also tend to have higher general levels of education.

Among the remaining variables there were no significant relationships. Some additional comments are in order concerning several variables. First, the regional variable, which consisted of the number of miles from the southeastern corner of a county to the Red River, deserves special mention because the visual map analysis suggested that a relationship existed. Visually, the impression was given that bankruptcies increased as distance west increased. This was not confirmed by the correlation analysis. To test for any problem in the distance measure used, two alternative schemes were applied for assessing the suspected regional relationship. First, two chi-square analyses were performed using North Dakota's state planning districts grouped into four north-south bands across the state. Using the average bankruptcy rates for 1985-1987, the chi-square test failed to yield a significant result ($x2 = 6.92$ with 6 d.f., $.3<p<.5$). Then, using the bankruptcy rates for 1987, those which visually suggested the greatest regional bias, the chi-square test also failed to yield a significant result ($x2 = 9.72$ with 6 d.f., $.1<p<.2$). In both tests the bankruptcy rates were categorized according to the scheme found on Figures 1-4.

The second alternative assesment for regional bias was based upon a political study. One recent assessment of the East-West conflict in North Dakota used the congressional district boundary from the period when North Dakota had two seats in the House of Representatives (Pedeliski, n.d.:31). This regional scheme was used in a chi-square analysis against the yearly average bankruptcy rates for 1985-1987 and the 1987 rates divided into the three categories found on Figures 1-4. Neither test produced significant results (1985-1987 data: $x^2 = .452$ with 2 d.f., $.7<p<.8$; 1987 data: $x^2 = 3.074$ with 2 d.f., $.2<p<.3$). Given these results, bankruptcy cannot be claimed to have a regional bias.

That the business climate measures (percentage change in manufacturing establishments, retail establishments, farm units, and wages) all failed to be significantly related to bankruptcy rates, leads to questions regarding the economic environment's possible relationships with bankruptcy rates. If these indicators of business activity are unrelated to bankruptcy rates, then the point must be raised that it is possible that bankruptcy is related to unique factors which are more connected to the people and firms involved than they are to the wider environment. The variables having significant relationships with bankruptcy rates were non-economic by nature. Logically, these variables could be related to economic behavior, but the linkages are indirect.

SUMMARY AND CONCLUSIONS

Bankruptcy rates during 1985, 1986, and 1987 have been found to be significantly related to population, population density, and urbanism in a positive direction and elderly populations and lower levels of educational achievement in a negative direction. These relationships exist across the three-year period and in 1985, but only urbanism has a relationship with the average bankruptcy rates across the period and with the rates in each year.

The breakdown of several relationships found significant in 1985 but not in 1986 and 1987, leads to the conclusion that bankruptcy relationships vary over time. Again, only the relationship with urbanism maintained itself in each of the three years, although the relationship with educational level was not significant only in 1986. The changing nature of several relationships suggests that while bankruptcy was once more related to larger populations and denser populations, it has changed over time to be a problem that affects all sizes of communities. In doing so, it also appears that it affects persons and firms in all regions of the state. Three different groups of tests for regional bias failed to find a significant relationship.

Eleven variables did not have significant relationships with bankruptcy rates during any one of the four test periods. Most important among these variable are economic indicators such as change in the number of manufacturing establishments or change in the number of farms. The lack of relationships suggests that unique and possibly non-economic factors are involved in pushing individuals and firms toward bankruptcy. More research in this area is certainly in order.

In reference to the theoretical scheme presented earlier, the development of bankruptcy as an element within a general systems view of North Dakota has progressed, but more work remains to be done on this topic. Certain connections between bankruptcy and environmental variables have been identified, while other connections have been found lacking. The case for bankruptcy as a signal of stress, possibly leading to political results, is reduced because there seems to be a lack of environmental connectivity between bankruptcy and other indicators of system-wide economic health. Further study, directly involving political action, is necessary to discover whether the signal of distress sent by bankruptcy to the local environment is clear enough or strong enough to overcome other positive or neutral signals.

The prospect of using bankruptcy as a variable in political studies of North Dakota, which is the long-term goal of this work, is both promising and clouded. It is clouded by the lack of relationship between bankruptcy and many variables with potential political importance. It is promising in that its lack of relationship with those same variables suggests a certain uniqueness which may fill gaps in the relationship scheme surrounding political behavior and events.

Consequently, a few closing comments on future research needs are in order. First, the data base must be extended further into the past. The goal would be the establishment of a base distribution which could be described as normal. From such a base the fluctuations in bankruptcies in North Dakota could be gauged better. The differences between the bankruptcy rates, distribution, and ecological correlates of 1985 and those of 1986 and 1987 suggest that two general patterns exist. The limitations imposed by the legal changes made during the late 1970's and 1984, restrict the length of time which could be used as a base period, but the inclusion of data from the early 1980's could enhance our view of this variable. Given the legal changes of the last decade, it is possible that no period of time could be identified as "normal." Nonetheless, if the pattern of bankruptcies over time is characterized by short periods of similar patterns and a lack of similarity between these short periods, then the search for like patterns in the local community and national society could result in the identification of important correlates of bankruptcy.

Furthermore, a more detailed data based needs to be established. Aggregate data can only go so far in suggesting relationships. The number of bankrupt individuals and firms is small compared to county populations. Many suggestive relationships could be explored with individual-level data. This would be a large step forward in providing answers to our questions about this important problem. In conclusion, this exploratory study provides a start in identifying the ecological correlates of bankruptcy in North Dakota, a topic that merits increased attention to understand the present nature of North Dakota's economic and political geography as the state ends its first century of statehood and prepares to starts it second.

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INITIAL DEVELOPMENT OF NORTH DAKOTA'S FIRST GEOGRAPHY AWARENESS WEEK

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ABSTRACT. Geography Awareness Week is a national celebration in geographic education that has been first held in 1987. The evolution of North Dakota's participation in this national activity is chronicled here in response to Martin's 1985 call for geographers to preserve their own history. Steps included an unsuccessful application for National Geographic Society Geography Alliance status, an invitation from the National Geographic Society for competing for a $1,000 of seed money, a series of drafts of the grant proposal to National Geographic Society, a successful final grant proposal, and a series of activities using that funding to promote geographic education across North Dakota. Based upon the success of Geography Awareness Week in 1987, efforts will be undertaken to continue this program as a vehicle for improvement in geographic education in North Dakota.

INTRODUCTION

During the week of 15-21 November 1987, geographers, school children and their teachers, and those who are friends of geography celebrated the first annual Geography Awareness Week across the United States of America. This event has had special meaning for members of the Association of North Dakota Geographers because the initial proclamation statement was authored by Ms. Christina Dando, secretary of the Association of North Dakota Geographers and a staff member of the National Geographic Society. Keeping in mind Martin's (1985) call for geographers to preserve records for facilitating the writing of future histories of geography, it is appropriate to present a perspective on how North Dakota's first annual Geography Awareness Week has developed as an offshoot of the national activities.

BACKGROUND

Geographic education has been undergoing a major revival during the decade of the 1980s. A comprehensive review of the resurgence of geography within social sciences and earth sciences is beyond the scope of this article. However, certain key developments of that change in geography as a discipline must be reviewed if North Dakota's involvement in Geography Awareness Week is to be put in the proper context.

By the mid-1980s, it was finally apparent that significant action had to be taken if geographic education were to meet the crisis in geographic understanding identified by the Presidential Commission on Foreign Language and International Studies (Gritzner and Phillips, 1986). Professional geographers from both the Association of American Geographers and the National Council for Geographic Education worked together to create Guidlines for Geographic Education: Elementary and Secondary Schools in 1984. Members from these two groups of professional geographers then began networking with personnel from the National Geographic Society and the American Geographical Society to establish the Geographic Education National Implementation Project (GENIP) in 1985 (Natoli and Mattson, 1985). GENIP's role in promoting geographic education has been significant, but its limited programming due to lack of funding stimulated other approaches to upgrading geography in the schools.

In order to accelerate the resurgence of geography in K-12 education, the National Geographic Society began supporting geographic alliances in 1986. These organizations, modeled after the California Geographic Alliance established in 1983, have expanded from the initial groups of Northern California, Texas, Colorado, Oregon, Tennessee, New Jersey, and the District of Columbia to include Alabama, Illinois, Kentucky, Minnesota, Missouri, North Carolina, and Virginia (Munroe, 1987). It is at this point that the Association of North Dakota Geographers became involved with the National Geographic Society's promotion of geographic education.

THE NORTH DAKOTA GEOGRAPHIC ALLIANCE APPLICATION

That the Association of North Dakota Geographers would seek to become affiliated with the National Geographic Society has been an outgrowth of developments since 1978 in geographic education in North Dakota. Starting in 1980, the Association of North Dakota Geographers began to establish stronger ties with the North Dakota Council for the Social Studies and the North Dakota Science Teachers Association. Shortly before the California Geographic Alliance model was unveiled by Salter (1986), there existed a defacto North Dakota "geographic alliance." However, members of the Association of North Dakota Geographers were stymied in networking with educators during the period that the North Dakota Department of Public Instruction was headed by Dr. Joseph Crawford, a notorious non-supporter of geography. Had a more supportive superintendent of public instruction been in Bismarck in the early 1980s, perhaps K-12 geography instruction in North Dakota would have become a model program similar to what has been promoted through the California Geographic Alliance approach. Fortunately, sufficient cooperation had developed with the administration of Dr. Wayne Sanstead that members of the Association of North Dakota Geographers were willing to submit an application for support for geographic education from the National Geographic Society.

Initial efforts to make an application to National Geographic Society began in October of 1986. Ms. Christina Dando, representing the National Geographic Society, described the programs being supported by that organization when she was a featured speaker at the Association of North Dakota Geographers meeting in Minot on October 17, 1986. At that time, members of the Association of North Dakota Geographers began to debate the merits of seeking formal recognition as the North Dakota Geographic Alliance. Concerns were expressed about the following issues:

1. Physical distances between centers of geographic education and high travel costs related to teacher inservice programs that always have made North Dakota less attractive to granting agencies compared to more populated states.

2. Low population density and highly dispersed pattern of schools in North Dakota which increases the per pupil cost to deliver curriculum improvements compared to highly urbanized states.

3. Limited interest among schools for a completely new curriculum in geography as compared to moderate to high interest for infusing increased geographic content into existing earth science and social science courses in grades K-12.

4. Tenuous existing ties among the cooperating statewide professional societies that have tended to reflect disciplinary rivalries as well as highly pronounced and sometimes conflicting regional identitites.

In the absence of Dr. Paul Meartz, president of the Association of North Dakota Geographers, who was ill with an eye injury, it was decided that no further action be taken concerning formal recognition of the North Dakota Geographic Alliance until a series of conference telephone calls were made in the month of November 1987 to resolve the four issues stated above. A committee was formed, however, during the business meeting convened by Dr. Douglas C. Munski, vice-president of the Association of North Dakota Geographers to represent the Association of North Dakota Geographers to the National Geographic Society. Named to that committee were Dr. William A. Dando, Dr. Warren Kress, Dr. Paul Meartz, Dr. Roland Mower, and Dr. Munski.

After a period of research, networking, and serious thought, a proposal was prepared by Dr. Munski in early November of 1986 on behalf of the committee. This application was submitted to the National Geographic Society on November 19, 1986. Unfortunately, it was not given funding by the National Geographic Society. However, the December 30, 1986 letter from Ms. Susan Munroe indicated an interest by that organization to discuss the topic further (Munroe, 1986). On February 20, 1987 the Association of North Dakota Geographers was invited to submit an application for a $1,000 Operating Funds grant (Jacobsen, 1987).

APPLICATION FOR PROMOTING GEOGRAPHY AWARENESS WEEK IN NORTH DAKOTA

It is ironic that the National Geographic Society's invitation for competing for a $1000 worth of support generated more correspondence and discussion than the preparation of the proposal for formal recognition of the North Dakota Geographic Alliance. In late February of 1987 efforts began to determine what should be done about the invitation to the Association of North Dakota Geographers to seek the $1,000 of support from the National Geographic Society. However an application could not be submitted by Dr. Munski until June 17, 1987. It was discovered that a $1,000 grant application can generate as much difficulty in it preparation as a proposal requesting $100,000 -- indeed, the smaller the amount of money, the more limited the options to maximize its effective use as a good steward. Yet, the exercise in networking has had significant results.

First, a special late winter meeting was held by Dr. Meartz on March 5, 1987 with a group that included representatives from the National Science Foundation project in earth science (climatology-meteorology) being operated on the campus of the University of North Dakota. Input from Ms. Ann Asbeck and Mr. Denis Mudderman led to Dr. Munski redrafting the initial version of the application for the $1,000 grant. Second, members of the Association of North Dakota Geographers made connections with members of the California Geographic Alliance. Dr. Dando's visit with Dr. Christopher Salter during the South Dakota State University's annual geography convention in late March of 1987 prompted him to recommend Dr. Salter and Ms. Cathy Riggs-Salter being funded as featured speakers. This led to Dr. Munski revising the application again prior to conference telephone calls made in early April. During the month of April, the application was placed on hold pending its approval by the members during the Spring meeting of the Association of North Dakota Geographers. That conference, scheduled for May 2, 1987 was deferred until May 20, 1987 due to conflicts relative to committee members not being able to meet as agreed upon during the Association of American Geographers convention in Portland, Oregon, and because of problems with coordinating end of the school year schedules.

The May 20, 1987 meeting, held in the Edna Twamley Room of Twamley Hall of the University of North Dakota, had mixed results. Dr. Munski was asked to revise the proposal again because those present from the Association of North Dakota Geographers membership wanted to have vide tapes as well as guest speakers being funded by the National Geographic Society. When it was determined on 30 May 1987 that the cost of the videotapes exceeded the budgeted figure, more emphasis was given to having the proposal redrafted to highlight guest speakers from the California, Colorado, and Minnesota geographic alliances. Unfortunately, the availability and then the cost of guest speakers was discovered to be an impedment to completing the proposal as approved at the Spring meeting of the Association of North Dakota Geographers. A written statement was submitted to the members of the Association of North Dakota Geographers on 31 May 1987 with a counterproposal outlined by Dr. Munski. This resulted in Dr. Munski making a series of telephone calls to the National Geographic Society to determine the exact parameters of the possible grant activities.

A meeting then was convened on June 16, 1987 in Gillette Hall on the campus of the University of North Dakota to bring the matter to an agreeable conclusion. Present at the meeting were Dr. Dando, Ms. Ann Asbeck, Mr. Denis Mudderman, and Dr. Munski; input had been secured by telephone calls to Dr. Meartz and Dr. Kress; Dr. Mower was unavailable in Utah. It was decided to revise the proposal once more. This document was presented in its rough form later that afternoon to Ms. Christina Dando, who was visiting the Department of Geography at the University of North Dakota while on leave from the National Geographic Society. Because of financial management requirements, the proposal was sent as a joint application from the Association of North Dakota Geographers and the Departmentof Geography at the University of North Dakota. Funding was granted in August.

PLANS FOR 1987 GEOGRAPHY AWARENESS WEEK IN NORTH DAKOTA

The plans for celebrating the first annual Geography Awareness Week in North Dakota that were submitted to the National Geographic Society reflect individual and group efforts. In order to provide an overview to these activities, it is appropriate to quote directly from the project description:

"Project Goals and Objectives. There are three goals for this project. They are as follows: 1) to strengthen the existing network of K-12 teachers and professional geographers that has evolved in the state; 2) to make every school district in North Dakota cognizant of Geography Awareness Week; and 3) to stimulate increased interest and activity in geographic education. These three goals can be accomplished by implementing the following objectives: 1) developing a "geographic literacy" campaign for the state's news media; 2) preparing and disseminating a locally produced teaching module on geography awareness based upon National Geographic Society's Maps, the Landscape, and Fundamental Themes in Geography and the AAG-NCGE Guidelines for Geographic Education; and 3) expanding the outreach services in geographic education from Association of North Dakota Geographers members engaged in teacher education at the University of North Dakota and its sister campuses across the state of North Dakota."

After receiving National Geographic support Dr. Munski worked with a team of master teachers and collegiate faculty during the period of July through mid-November to "blitz" the state's newspapers, radio stations, and television stations witn guest editorials, news releases, and public service messages concerning Geography Awareness Week and to develop a five-day teaching activicy for promoting geography awareness. This part of the project was undertaken during mid-August through mid-October by Ms. Asbeck and Ms. Rebecca Ratchenski with Dr. Munski. Teaching module was developed included the following topics:

Day 1: Geography All Around Us (how to analyze the news in a geographical fashion)

Day 2: More than a Map (using the state road map as a data base for critical thinking about our region)

Day 3: Down Home with Geography (how to interpret the local landscape from a spatial perspective)

Day 4: Global is GEO-graphy (using the teme of energy development as a geographical issue connecting North Dakota to other parts of our planet)

Day 5: Career and Geography (investigating the ways that geography is a part of everyone's working day)

The teaching module was previewed at the North Dakota Education Convention in Fargo on 16 October 1987. Finally, there were a set of follow-up activities. Teachers would be asked to evaluate the materials distributed to them in time for Geography Awareness Week. These K-12 educators were asked to contribute lesson plans for inclusion into next year's Geography Awareness Week, too. In this way, a focus would be given to outreacn services by North Dakota institutions of higher education concerning geography workshops and related activities to be conducted from mid-November of 1987 through mid-July of 1988. Laving National Geographic Society support for this project facilitated making Geography Awareness Week the start of Geography in Every Week in North Dakota's schools."

CONCLUSION

Whether or not support has been given to North Dakota's first annual Geography Awareness Week, there were these -- and other -- activities based upon this proposal. Consequently, it is important to know what led to this project in the first place. Perhaps it is presumptious to follow Martin's (1985) urging to preserve the history of geography while it is in the making because the Association of North Dakota Geographers is so small an organization. Yet, the Association of North Dakota

Geographers is one of the oldest statewide geographical societies. Established in 1947, it has been engaged in geographic education activities longer than any of the National Geographic Society geographic alliances. It may be that by informing its members of this latest program by the Association of North Dakota Geographers that those members will be more willing to expand the state's network in geographic education. As importantly, this article might prompt older members of the Association of North Dakota Geographers to seek out correspondence and other documents that can be placed into an archive for the statewide geographical society that will provide future historians of geography with insights as to how the Association of North Dakota Geographers was engaged in geographic education prior to the 1980s. Finally, this article should serve as the "call to arms" for developing an agenda for geographic education for North Dakota for beyond the 1980s.

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GEOGRAPHY AWARENESS WEEK

NORTH DAKOTA LESSON PLAN PACKET

Compiled by Ann Asbeck and Douglas C. Munski

November, 1987

Support for this material was provided principally by

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Institute for Remote Sensing-Department of Geography
University of North Dakota

FIRST ANNUAL GEOGRAPHY AWARENESS WEEK IN NORTH DAKOTA

Dedicated to the Memory of Dr. Bernt Lloyd Wills

Introduction

Celebrating the first annual Geography Awareness Week in North Dakota between November 15-21, 1987, has special meaning for us in this state. Why? Because Ms. Christina Dando, a graduate of both Central High School of Grand Forks and the University of North Dakota, was responsible for the initial work on the Congressional legislation declaring Geography Awareness Week. Then, too, we have thanks to give to Mr. Gene Martin and Mr. Robert Kulack for helping lobby for a North Dakota proclamation about this week from Gov. George Sinner. Indeed, it is appropriate for us to have such proclamations to reflect upon the importance of studying geography and using geographical approaches as part of a well-rounded education of all citizens of the United States. As never before in our nation's history, we need people who can answer the questions of what is there, where is it, and why is it there from a spatial and global perspective.

Acknowledgments

This lesson plan packet to promote studying geography during Geography Awareness Week is the product of many people. Thanks to the support of the National Geographic Society, a major part of the costs have been paid from that organization's grant of $1,000 to the University of North Dakota's Department of Geography and to the Association of North Dakota Geographers. Ms. Ann Asbeck has done a significant job in creating the majority of the lesson plans in this packet; also to be thanked for writing a specific lesson plan is Ms. Rebecca Katchenski. Suggestions and background materials also were provided by these teachers: Ms. Virginia George (Bismarck), Mr. Chuck Cochran (Fargo), Mr. Doug Weberg (Midway-Inkster), and Ms. Bonny Berryman (Minot). Members of the Association of North Dakota Geographers such as Dr. Warren Kress (Fargo), Dr. Paul Meartz (Mayville), Dr. Roland Mower (Grand Forks) and Dr. William A. Dando (Grand Forks) assisted in different ways. Finally, the secretarial help of Ms. Lara Dando and the program delivery help of Ms. Laura Munski must be recognized. Truly, this has been a statewide undertaking!

Conclusion

You may use this lesson plan packet at anytime because it is designed to promote geographic education during and after Geography Awareness Week. Please critique the lessons after you use them and send your comments to us. Most importantly, please provide lesson plans that you have created so we can circulate them in time for next year's Geography Awareness Week. So, thank you in advance and best wishes for pursuing geography where you are!

--D. C. Munski

One Hundredth Congress of the United States of America

AT THE FIRST SESSION

Begun and held at the City of Washington on Tuesday, the sixth day of January, one thousand nine hundred and eighty-seven

Joint Resolution

To designate the period commencing November 15, 1987, and ending November 21, 1987, as "Geography Awareness Week".

Whereas the United States of America is a truly unique nation with diverse landscapes, bountiful resources, a distinctive multiethnic population, and a rich cultural heritage, all of which contributes to the status of the United States as a world power;

Whereas geography is the study of people, their environments, and their resources;

Whereas, historically, geography has aided Americans in understanding the wholeness of their vast nation and the great abundance of its natural resources;

Whereas geography today offers perspectives and information in understanding ourselves, our relationship to the Earth, and our interdependence with other peoples of the world;

Whereas 20 percent of American elementary school students asked to locate the United States on a world map placed it in Brazil;

Whereas 95 percent of American college freshmen tested could not locate Vietnam on a world map;

Whereas 75 percent of Americans responding to a nationwide survey could not locate El Salvador on a map, while 63 percent could not name the two nations involved in the SALT talks;

Whereas over 20 percent of American teachers currently teaching geography have taken no classes in the subject and, therefore, do not have the training necessary to effectively teach geographic concepts;

Whereas departments of geography are being eliminated from American institutes of higher learning, thus endangering the discipline of geography in the United States;

Whereas traditional geography has virtually disappeared from the curricula of American schools while still being taught as a basic subject in other countries, including Great Britain, Canada, Japan, and the Soviet Union;

Whereas an ignorance of geography, foreign languages, and cultures places the United States at a disadvantage with other countries in matters of business, politics, and the environment;

Whereas the United States is a nation of worldwide involvements and global influence, the responsibilities of which demand an understanding of the lands, languages, and cultures of the world; and

Whereas national attention must be focused on the integral role that knowledge of world geography plays in preparing citizens of the United States for the future of an increasingly interdependent and interconnected world: Now, therefore, be it

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the period commencing November 15, 1987, and ending November 21, 1987, is designated as "Geography Awareness Week", and the President is authorized and requested to issue a proclamation calling upon the people of the United States to observe such week with appropriate ceremonies and activities.

Ronald Reagan

State of North Dakota

OFFICE OF THE GOVERNOR
BISMARCK, NORTH DAKOTA 58505
(701) 224-2200

NORTH DAKOTA CENTENNIAL

GEORGE A. SINNER
GOVERNOR

PROCLAMATION

A desire to learn and record information about the earth inspired the early explorers of our land. This legacy of inquiry is carried on in the science of geography, a study of the surface of the earth, and its people, environments, resources, political boundaries, and characteristics.

For generations, comprehension of world and national geography has been considered essential to the education of Americans. Yet today, in an interdependent world where knowledge of other lands and cultures is increasingly important, studies show that Americans need more geographical knowledge.

Citizens, especially young people, should become fully informed about our country and our neighbors; geography's expanding study of the oceans and the universe; the increasing wealth of knowledge provided by research in the disciplines that support geography; and geography's physiographic, historical, social, economic, and political aspects.

For these reasons, I proclaim the week of November 15-21, 1987, as

"GEOGRAPHY AWARENESS WEEK"

in North Dakota.

Dated this twenty-eighth day of October, 1987.

GEORGE A. SINNER
Governor

ATTEST:

Secretary of State

By ____________________
Deputy

DOWN HOME WITH GEOGRAPHY

Intended grade level: grades K - 3

Introduction:

The basic unit of geographic study is the REGION, an area that displays unity in terms of selected criteria. Some regions are defined by one characteristic, such as a governmental unit or a landform type, and others by the interplay of many complex factors. Geographers have developed regions as tools to examine, define, describe, explain, and analyze the human and physical environment.

Objectives:

1) To define the geographic theme of "region."
2) To practice observing a landscape and recording the observations.
3) To interpret a simple map of a familiar landscape in terms of regions.
4) To prepare a simple regional map of a familiar landscape.

Learning experiences:

1) Defining regions through observations of a familiar lanscape.
2) Interpreting a simple regional map based upon a familiar landscape.
3) Preparing a regional map of a familiar landscape.

Materials: 3-5 prepared outline maps of a familiar landscape (such as the school yard, the school block, or a section of the inside of the school) with no key or names of map features; a large pad of paper for recording student responses; several sets of markers or crayons

Lesson content:

ACTIVITY 1:

Explain and discuss the term "landscape" (what we know or can determine about an area. Using an area predetermined by the teacher, ask students to close their eyes and try to picture that area in their minds. After sufficient time, ask students to help prepare a list of what they "saw" in that area. Record their responses and save the list.

Next. take the students to the area. Explain that students should observe carefully what is in the area. paying special attention to features which they may wish to add to their earlier list. The teacher or a classroom aide may serve as the recorder for items to be added to the earlier list. Also walk the boundaries of the selected area. Ask students why they think the teacher chose those particular boundaries or if other boundaries would be just as good.

Save this information for Activity 2.

ACTIVITY 2:

Looking at the list generated in Activity 1, ask students if they could sort the items on their list into various categories (for example, by functions or materials or color, ect.) Do sorting to produce a category which contains several landscape features (such as "areas where we can play" or "areas where there is grass").

Show students the prepared outline map of the observation area. Then take the students to the observation area and orient the map to the area. Using the category chosen earlier, color all of the features on the outline map which fit that category. Prepare a map key which tells what that color represents and any other symbols which the students wish to define on the outline map. A map title should also be chosen and put on the map.

Explain that by carefully chosing categories from their observations, the students have created a region. If the school has examples of thematic maps (for example, climate or vegetation types), show these as examples of geographic regions.

ACTIVITY 3:

Using the remaining, unused outline maps and the categories created earlier, have the students return to the observation area and attempt to color other regions. Be sure that a key is prepared and a map title chosen for each regional map produced. For young students, it would be best to identify only one region on each map.

This lesson plan was prepared for Geography Awareness Week by:

Ann Asbeck
University of North Dakota, Grand Forks

GEOGRAPHY ALL AROUND US

Intended grade level: grades 4 and 5

Introduction:

People modify and adapt to natural settings in ways that reveal their cultural values, economic and political circumstances, and technological abilities. Geography focuses on understanding how such human-environment interactions develop and what their consequences are for people and for the environment. The news media often present these relationships but generally do not identify the spatial aspects of the relationships as geography. With an awareness of the geographic concept of HUMAN-ENVIRONMENT INTERACTION, news media can be used to investigate this concept with students.

Objectives:

1) To define the geographic concept of "human-environment interaction."
2) To analyze various environmental situations in terms of their spatial variation as well as in terms of positive and negative consequences; specifically, to describe the spatial and consequential characteristics of daily weather changes as reported in a daily newspaper.
3) To be aware that various groups see different possibilities and constraints in physical environments.

Learning experiences:

1) Reading and interpreting media weather map symbols at a very basic level.
2) Determining daily changes in weather based on a series of newspaper weather maps.
3) Reading weather descriptions, forecasts and weather-related articles in daily newspapers in order to interpret them in a spatial context.

Materials:

- a local daily newspaper with a weather page (one per student or easy access for all students)
- a national daily newspaper with a weather page (one per group of 3-4 students or easy access for all students)
- at least one copy of the papers selected above from which items can be cut with a scissors
- a large classroom map of North America (preferably with a laminated surface)

Lesson content:

ACTIVITY 1: Reading and interpreting weather map symbols as found in newspaper weather maps

Using the background materials* provided with this exercise, <u>discuss</u> with the students. at a very basic level, the meanings of symbols found on a local or national daily weather map of your choice. Cut out the descriptions of current weather or forecasts and tape them to the corresponding region on the map of North America. Also try to find news articles which are weather-related. Cut them out and tape them to the map also. Explain to students that this "reading and research" will be their part in the activities for the remainder of the week.

* Part of materials prepared for the National Science Foundation Meteorology/Climatology Materials Development Project of the UND Geography Department.

ACTIVITY 2: Determining daily changes in weather-based on newspaper weather maps and reports. Interpreting newspaper weather reports in a spatial context and in terms of human-environment interaction.

Have students continue to read the newspaper for weather-related articles, weather descriptions, and weather forecasts. As they find articles, they should cut them out so they can be taped to the map. Each day the articles should be shared by the class as a whole as they are to attached to the map. Class discussion should cover the following points:

1) How have the fronts moved, temperatures changed, and precipitation patterns changed from the previous day?

2) How do people react to daily changes in weather? Are these reactions different for different regions of the country? (For example, how would the reaction to a moderate snowfall in October in North Dakota differ from the reaction to a moderate snowfall in October in Florida?)

3) Have any weather events occured that have strongly affected people (especially severe weather conditions)? How did people respond? Would that response be the same in all parts of the country? Why or why not?

This lesson plan was prepared for Geography Awareness Week by:

Ann Asbeck
University of North Dakota, Grand Forks

Introduction: Mapping and Interpreting Weather Data

Weather maps are used extensively by meteorologists and climatologists to easily observe all available weather data, at a given time, for a very large area. Distribution patterns of atmospheric pressure are enhanced on weather maps by a process called isoplething, that is constructing lines of equal values. Lines of equal barometric pressure are called isobars. Lines of equal temperature, called isotherms, are not generally found on official weather maps , but they are commonly found on popular weather maps such as those found in newspapers and on television weather reports. Weather data lends itself well to isoplething because so much of it is numerical in nature.

"Iso" means equal in Greek; therefore <u>iso</u>lines are lines connecting points of equal value of any phenomenon which can be expressed numerically. A sampling of "iso" terms often used on meteorological and climatological maps is as follows:

Isoline: lines of equal anything

Isopleth: lines of equal values, a general description

Isarithm: lines of constant value, similar to isopleth

Isobar: lines of equal barometric pressure

Isohel: lines of equal sunshine

Isohyet: lines of equal rainfall

Isokeraunic: lines of equal thunderstorm incidence

Isoneph: lines of equal degree of cloudiness

Isonif: lines of equal snowfall

Isoryme: lines of equal frost incidence

Isotherm: lines of equal temperature in air or sea

Introduction: Fronts

A weather front is a boundary between two distinct air masses. A front begins as a stationary line between air masses. Increasing contact between the opposing air masses magnifies the contrasts and the front becomes longer and more sharply defined. Eventually, one of the two air masses becomes dominant and begins to encroach on the other(s). The front moves forward displacing the weaker air mass (or masses). Often times the front moves, or is steered by winds in the upper atmosphere such as jet streams. The front will make forward progress at a ground speed which is roughly half the speed of the upper level winds that influence it.

A front is named a cold front or a warm front based upon which air mass, behind the front, is advancing and which is retreating. A cold front is the boundary along the leading edge of a cold air mass that is pushing out a warmer air mass. As the cold front approaches the air pressure falls. Large cumulonimbus clouds form along the front and they often bring thunderstorms and violent weather. As the front passes the weather takes on the characteristics associated with the air mass behind it. In a warm air mass, the humidity is high (warm air holds more moisture), temperatures are warm, and winds are cyclonic (are moving toward the low pressure center). After the cold front passes the humidity drops (cold air holds less moisture), air pressure increases (cold air is more dense), temperatures drop, and the wind shifts to anticyclonic flow (away from the center of high pressure).

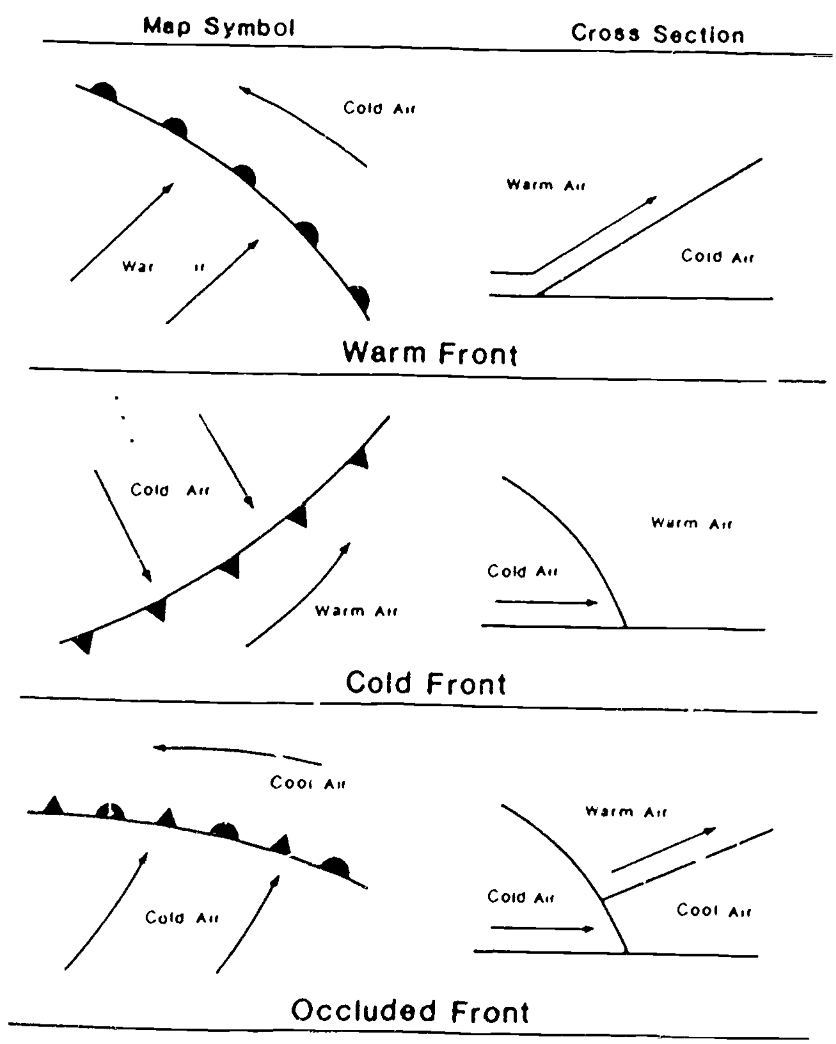
A warm front occurs when an advancing warm air mass is forced upward after collision with a cold air mass. Here eventually nimbostratus clouds develop and milder forms of precipitation occur such as showers and drizzle in warm seasons or gentle snow flurries in winter. The weather differs from a cold front passage (cool temperature, clear skies, low humidity, high pressure, high wind speeds, and anticyclonic flow) to that of a warm air mass type (warmer temperatures, cloudy skies, and often showers, high humidity, low pressure, gentle breezes, and cyclonic flow).

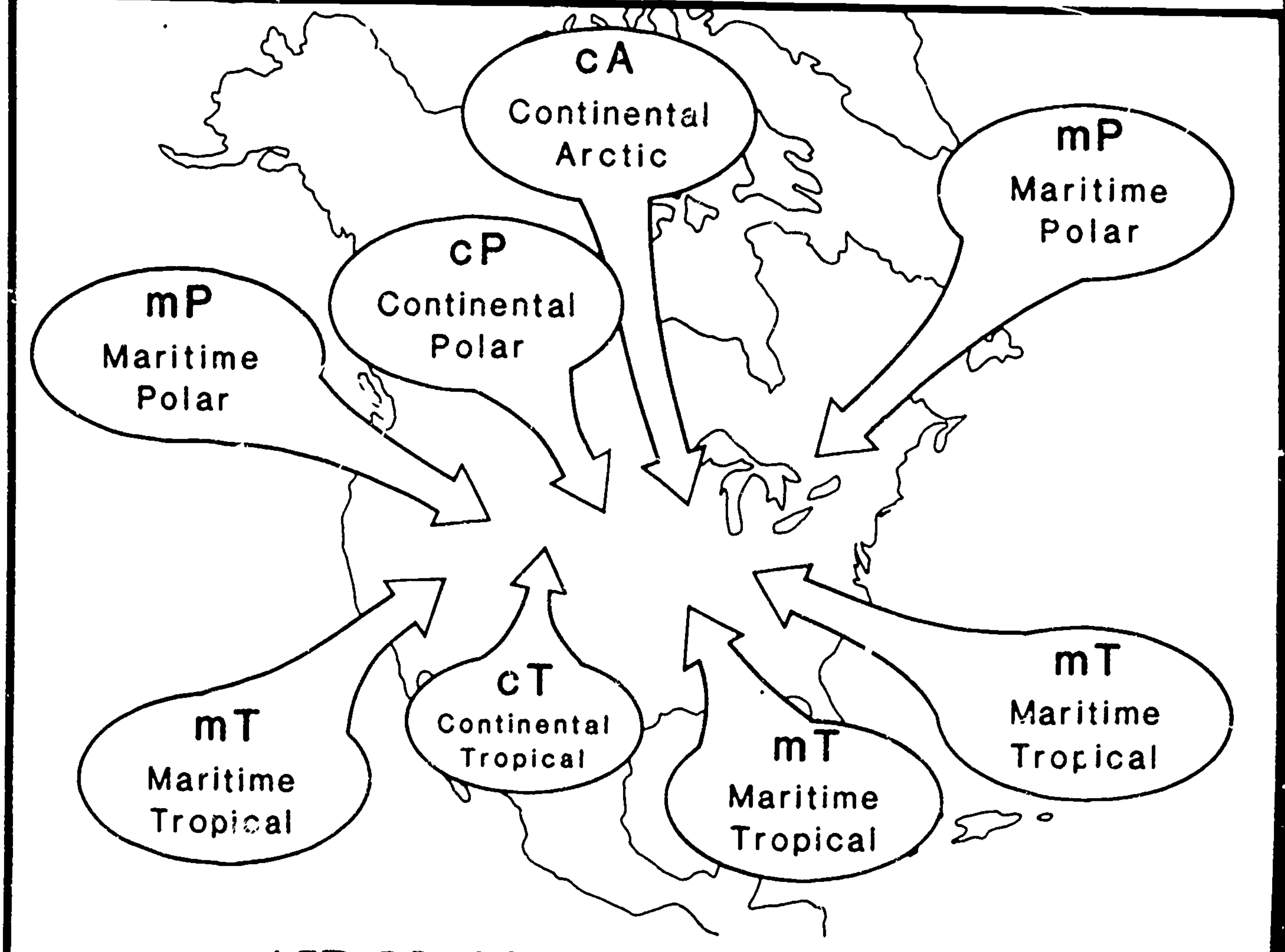
An occluded front is a special front that occurs when one front advances fast enough to overtake another front. There are warm front occlusions and cold front occlusions. Cold fronts move faster than warm fronts because cold air masses are more dense and can more effectively displace warm air masses. A cold front occlusion produces a pocket of warm moist air trapped at some elevation above Earth's surface. Conversely, warm fronts move slower because warm air is less dense and exerts less pressure on the air mass that it is advancing through. A warm front occlusion also produces a pocket of warm moist air trapped at some elevation above Earth's surface. Heavy, steady rain or snow is associated with the thick layers of stratus and cumulus clouds which form in the occluded conditions.

Cold and warm fronts each have a distinctive slope. Because cold fronts move fast they have a steeper slope. Friction at the surface and higher pressure air behind them result in a slope that is far from gradual. Because of the speed they move and the steepness of the front, cold fronts are sometimes associated with violent weather, thunderstorms, hail, tornadoes, heavy snowfalls, and blizzards in the winter. As a cold front advances, it abruptly forces upward the warm moist air in front of it which causes the violent weather. The line of heavy thunderstorms along a cold front can be hundreds of miles long. Sometimes two or three non-frontal bands of active thunderstorms (squall lines) develop simultaneously in the warm air ahead of an advancing cold front.

The slope of a warm front is much more gradual. Warm fronts move slowly and often cause cloudy skies for hundreds of miles in advance of the actual front. Because of the gradual slope of the front however, the clouds are the horizontal types such as stratus and altostratus. Precipitation is far less violent but more widespread. Cold fronts bring violent weather which passes an area quickly while warm fronts bring gentler rain or snow showers which sometimes remain in the same area for several days.

Most Common Atmospheric Fronts





AIR MASS SOURCE REGIONS

CAREERS AND GEOGRAPHY

Intended grade level: grades 5 and 6

Introduction:

Themes and skills of geography are part of our everyday lives although many people do not call this particular knowledge "geography." Geography provides an effective method for asking questions about places on Earth and for helping make decisions about life on Earth. The primary tools of the geographer are those which readily reveal spatial relationships such as maps, aerial photographs, and satellite imagery. These tools reflect the various perspectives from which geographers view the earth.

A geographic viewpoint is also based upon five fundamental themes* :

LOCATION: Position on Earth's Surface

PLACE: Physical and Human CHaracteristics

RELATIONSHIPS WITHIN PLACES: Humans and Environments

MOVEMENT: Humans Interacting on Earth

REGIONS: How They Form and Change

*Based upon Guidelines for Geographic Education prepared by the Joint Committee on Geographic Education of the National Council for Geographic Education and the Association of American Geographers.

Although people who are not professional geographers would not use these tools and themes in quite the same way as a geographer, they are commonly found in most everyone's daily life. Some careers, other than that of geographer, also use these tools and concepts to assist them in their work.

Objectives:

1) To define the five fundamental themes of geography.
2) To be aware of maps, aerial photographs, and satellite imagery in our daily lives.
3) To investigate the use of geographic themes and tools in various careers.

Learning experiences:

1) Defining the five fundamental themes of geography using student-generated examples.
2) Observing and recording the use of maps, aerial photographs, and satellite imagery in people's daily lives.
3) Investigating the use of geographic themes and tools in various careers.

Materials: large sheets of paper on which to record student responses; markers; a teacher-prepared handout listing the tools and themes given in the Introduction to this lesson.

Lesson content:

ACTIVITY 1: Defining the five fundamental themes of geography.

Using Guidelines for Geographic Education as a reference, list the names of the five fundamental themes of geography on the board. Briefly explain each theme. Then ask for students to give examples of each theme, beginning with PLACE and working through to REGION. Record students' responses on large sheets of paper, at least one sheet of paper per theme. After the class discussion, post the sheets in readily viewed parts of the classroom. Suggest students add to the lists of examples throughout the week based upon their experiences of the week.

ACTIVITY 2: Observing and recording the use of maps, aerial photos, and satellite imagery in people's daily lives.

Having explained that these items are the basic tools of geographers, ask students to give examples of these tools being used by themselves or others according to their experiences. Discuss briefly how these three types of imagery are produced; if possible, show examples of each.

Throughout the day and at home in the evening, ask students to look for examples of these items and how they were being used. They should be prepared to share their findings with the class. It may be helpful to suggest that each student come with five new examples by the next class period. (HINT FOR STUDENTS: Watch the evening news and look at the newspaper.)

ACTIVITY 3: Investigating the use of geographic themes and tools in various careers.

Based upon familiarity with geographic themes and tools gained in Activites 1 and 2. students should now be able to consider the use of them in various careers. As an example, have students suggest ways in which a mail carrier would use them. Responses should include such examples as:

- reading a map to find his/her mail route
- seeing a satellite image as part of the local weather forecast to know how to dress for the day
- LOCATION: determining the street address of a particular house
- PLACE: determining whether mailboxes are on the street or attached to houses in various neighborhoods
- RELATIONSHIPS BETWEEN HUMANS AND ENVIRONMENTS: considering how weather will influence the day's work
- MOVEMENT: planning how to cope with a road block or wet cement on a block's sidewalks
- REGIONS: deciding which area is preferred for delivering mail if given a choice

Having completed this, divide students into small groups and ask each group to generate ideas about how people in various careers (one career per group) would use geographic tools and themes. Some suggested careers for consideration are: pilot, truck/bus driver, travel agent, reporter, farmer, construction worker, civil engineer (bridge designer), salesman

NORTH DAKOTA CLASSROOM ROAD RALLY

Intended grade level: grades 6, 7, and 8

Introduction:

Americans are a mobile people who travel often by automobile. Road maps are geographic tools which help drivers plan their trips and make decisions while on the road. Weather may sometimes make travel hazardous. Therefore, knowing how to use a road map is a basic survival skill.

Objectives:

1) To become familiar with with characteristics of road maps.
2) To identify road map symbols and their meanings.
3) To be able to make logical and economical travel decisions based upon using a road map.

Learning experiences:

1) Discussing types and uses of maps in general.
2) Reading and interpreting a state road map (North Dakota map)
3) Making decisions based on a state road map.

Materials:

- a North Dakota state road map (one per student)
- overhead projector and transparency pens
- study guide as provided in this lesson plan

Lesson content:

ACTIVITY 1: Types and uses of maps in general

Introduce the topic by asking students the following questions:

1) How many of you have ever been out of town?
2) Where did you go?
3) How did you know how to get there?
4) Have any of you ever been on a trip to visit relatives or on a vacation?
5) Where did you go?
6) How did you know how to get there?
7) Did anyone use a map?
8) Why do you think a map was used?
9) What is a map?

Pass out the road maps and study guides to each student. Have the students work in small groups of 2-3, depending upon the class personality. The teacher should circulate to keep students on task and to answer questions. After 15-20 minutes bring the students back together as one group. Use the overhead and put a copy of the study guide up on it. Have the students fill it in, encouraging everyone to participate.

ACTIVITY 2

Pass out the road maps. Make giant flash cards of commonly use symbols. Ask the following questions:

1. What is a symbol?

2. Why do we use symbols?

Have students look at their maps. Ask them for examples of symbols that are used on that map. Pull down some of the classroom maps and look at the legends/keys on these maps. How are the classroom map symbols different from the road map symbols?

ACTIVITY 3

Have students draw names of North Dakota towns out of a basket. Then have students write out how they would get there and how long they think it would take to get there. They must do 3 towns fo a "C" grade; any more would be bonus points. Each town is worth 10 points.

This lesson plan was prepared for Geography Awareness Week by:

Rebecca Ratchenski
Formerly a teacher at Valley Junior High School in
Grand Forks and currently a graduate student in the
Center for Teaching and Learning at UND

Study Guide on Maps

Name ____________________

1. What is a map?

2. List and describe three types of maps.
   a.

   b.

   c.

3. What type of map do you have?

4. What are the numbers and letters on the sides of the map used for?

5. What is the number and letter location of LaMoure? ________

   Beulah? ________ Leith. ________ Hamilton? __________

6. What are 4 types of U.S. numbered and interstate numbered highways?
   a. b.

   c. d.

7. Which one would be the fastest to travel on? Why?

8. What are two types of state numbered highways?
   a. b.

9. What color are the county boundaries?

10. What county is Bismarck in?

11. Draw the symbol for an interstate marker.

12. Draw the symbol for a U.S. numbered highway.

13. What does a state route marker look like?

14. Know your directions of north, south, east, and west. Draw an outline map of North Dakota on the back of this page and label directions North South, East, and West on it.

15. How many miles is it from Minot to Beulah? __________
    From Grand Forks to Valley City? _________

16. Using a ruler, how many miles is it from Langdon to Walhalla?

________ From Mayville to Hillsboro? ____________

From Watford City to Williston? ______________

17. List 2 reasons why it is handy to know how to read a map.
 a.

 b.

18. How far is one inch on this map? Use the scale and a ruler.

19. What is the popluation of Tappen? __________ Of Crosby? __________

20. If you drove northwest on U.S. Highway 52 from Harvey for 28 miles, what town would you be in?

21. What town is straight south 14 miles on U.S. 281 from New Rockford?

22. What town is south of Fargo 56 miles on Interstate 29?

23 Using the chart on the back of the map, find out the following distances:

 a. Forman to Medora __________ b. Towner to Beach ______

 c. Rolla to Bowman __________

24. Give 4 examples of symbols used at state parks. You can draw or list them.
 a. b.

 c. d.

25. What 2 facilities are the most important to you?

 a. b.

26. List three ways to find distance on a road map.
 a.

 b.

 c.

Quiz on Using Road Maps

Name ______________

<u>Matching</u>: Place the letter of the definition in front of the term that it best describes. Use your map to help you answer some of the questions.

_____ 1. political

_____ 2. physical

_____ 3. specific

_____ 4. U.S. Interstate

_____ 5. label the directions on this map

_____ 6.

_____ 7.

_____ 8.

_____ 9. the distance from Cavalier to Grand Forks

_____ 10. the distance from Fargo to Fessenden

_____ 11. Interstate 94

_____ 12. Interstate 29

_____ 13. 1 329 people

_____ 14. 74 people

_____ 15. U.S. Highway 85

_____ 16. Ward

_____ 17. Amidon

_____ 18. scale

_____ 19. symbols

_____ 20. legend

A. this town is 24 miles north of Bowman on U.S. 85

B. type of map that shows geographical features like lakes, rivers, mountains, plains, etc.

C. highway that runs east and west across North Dakota

D. the population of Dickey

E. North

F. South

G. East

H. West

I. the county Minot is in

J. a 4 lane highway with no traffic directly exiting or entering on or off of it; the fastest and safest way to travel

K. 84 miles

L. type of map that shows boundaries of countries, states, counties, and towns and cities

M. 166 miles

N. U.S. highway that runs north and south on western border of N.D.

O. highway that runs north and south on eastern border of N.D.

P. type of map that is for a special purpose such as rainfall, population or crops

Q. population of Underwood

S. used to show distances on a map in relation to the real distance

T. used to represent places or facilities

MORE THAN A ROAD MAP

Intended grade levels: 7-8

Introduction:

All places on Earth have distinctive tangible and intangible characteristics that give them meaning and character and distinguish them from other places. Geographers generally describe places by their physical or human characteristics. Direct observation and recording of observations provides the primary sources of data about a landscape. A map, such as a state highway road map, provides a composite of selected primary data which can serve as a data base for examining the geographic concept of PLACE. Taken together, the physical and human characteristics of places provide keys to identifying and interpreting the simple to complex interactions and interrelations between people and their environments.

Objectives:

1) To define the geographic concept of "place."
2) To understand that all places on Earth have special features that distinguish them from other places.
3) To use a state road map as a data base for examining the physical and human characteristics of a place (the state).
4) To recognize and interpret symbols used on a state road map.
5) To participate in a cooperative-learning and critical-thinking activity.

Learning experiences:

1) Identifying data available on a state road map.
2) Recognizing map symbols and their meanings.
3) Comparing road maps from various states as geographic data sources.

Materials:

- a current ro   of your home state (one for every two students)
- several current road maps from other states (one for every 3-4 students; try for maps with very different topography from home state)
- paper for recording answers to the map-based questions
- large pad of paper for recording student responses (to be saved)
- 3" x 5" cards with names of road map symbols (specifics in Activity 2)

Lesson content:

ACTIVITY ONE: Identifying data available on road maps

With the entire class, <u>discuss</u> and <u>record</u> student responses to the questions:

1) What is a map?
2) What types of information (data) are found on road maps?
3) Which information describes physical characteristics of the landscape? Which describes human characteristics of the landscape

Answer the questions without looking at the road maps. Save the responses for Activities 2 and 3.

Divide the class into teams of 2 students, giving each pair a home state road map. Using the map, ask each team to generate their own list of the type of data available on the home state road map. They should again distinguish between physical and human characteristics. Remind students that they are not looking for specific pieces of data, but rather types of data. Their team lists will be shared with the class in Activity 2.

ACTIVITY 2: Recognizing map symbols and their meanings

Briefly discuss with the class the following questions:

1) What is a symbol?
2) Why do we use symbols?
3) How do we know what symbols on maps represent?

Looking at the road map, ask students to describe the symbols given in the map key for the following symbol names:

(These are also the names which should be written on the 3" x 5" cards; one per card.)

National and State Parks
Commercial Airports
Colleges and Universities
Cities of Population 10,000 or more
Federal Roads - Interstates and Federal Highways
Water Bodies - Lakes and Rivers
County Boundaries
Ports of Entry
Hospital Locations
Dams
Fish Hatcheries
State Two Lane Roads
Railroads
Rest Areas
Distance Symbols - Mileage Scale and Mileage Numbers

Have each student team (2 students per team) draw one of the 3" x 5" cards with the name of a symbol on it. Using their symbol, each team should answer the following questions using the state road map:

1) There is much information and many symbols printed on the road map. What do you know about the information (data) your symbol represents which will help you find your symbol more easily on the map? [For example, hospital symbols would most likely be found in or near cities.]

2) Locate 3 or 4 examples of your symbol on the road map. Were they easy to find? Does the symbol give specific information about what it represents such as its name or number? If so, list 3 examples of the information found.

3) Try to locate 3 or 4 more of your symbols on the map. Do the locations form a pattern on the map, such as circular or linear or always found near some other map symbol? If so, describe the pattern.

BE PREPARED TO SHARE YOUR ANSWERS IN ACTIVITY 3

ACTIVITY 3: Comparing various state road maps as geographic data bases

Discuss the team responses to the three questions from Activity 2 about map symbols.

After the discussion of the home state road map, have students form teams of four persons and answer the following questions about a road map from another state. Students should be prepared to share their findings during the the second half of the class period.

1) Are the same symbols on the home state road map used on the road map from another state? Which symbols are common to both maps? Which symbols are not common to both maps? Can you explain why this might be the case?

2) Using the same symbols assigned in Activity 2 (thus each new team will have two symbols to consider), answer the questions from Activity 2 for the road map for another state.

3) Share team findings with the entire class.

This lesson plan was prepared for Geography Awareness Week by:

Ann Asbeck
University of North Dakota, Grand Forks

Global is GEO-graphy

Intendcd grade level: grades 9-12

In roduction:

Common, "domesticaally-produced" items (such as a pencil or a chocolate bar) are often, in reality, the results of bringing raw materials from various parts of the world into a United States factory. Consideration of the production of such items can lead to an awareness of the interconnections of our global economy and the fundamental geographic theme of MOVEMENT.

Objectives:

1) To define the geographic theme of "movement."
2) To become aware of the distribution of several of Earth's resources.
3) To consider the interconnections between places due to production of finished products from raw materials.

Learning experiences:

1) Determining raw materials necessary to create a final product and the source of the raw materials.
2) Tracing the path of raw materials from the site of origin to the site of final processing.
3) Considering factors which promote or discourage economic interconnections.

Materials: outline map of the world for each student; classroom wall map of the world (preferably laminated); access to library resource materials, especially thematic maps of world resource distribution

Learning co.. ;r.:

ACTIVITY: (3-5 days duration)

Briefly discuss with students the interconnections between countries due to the necessity of moving raw materials from their source areas to areas of intermediate and final production of an item. Tell students that the "final product" for consideration in this activity is a newspaper delivered to one's doorstep. Then ask students to list the components they believe are necessary to produce and deliver a newspaper. Record student responses on the blackboard. When completed, the list should include at least these items:

newsprint	ink
computers	presses
telephones	trucks
cameras	

Each student should be assigned a specific component from one of the items on the list and then be asked to seek the originating place for the particular item. This should be at least a two day project. For example, newsprint can come from Canada, bit it probably started out as a tree in the

Canadian shield or British Columbia's cordillera. Likewise, American computers generally have parts from Japan and may have been assembled in Hong Kong. After several days of research, each student should prepare a map showing the origin-destination linkages. For consistency in format, outline maps of the world should be given to students. Each map should have a title and a key. The maps should be collected and posted throughout the room. Students should be asked to prepare a paragraph describing commonly found origin-destination linkages and any linkages which they found to be surprising to them.

An additional class period could be used to discuss the students' individual findings and summary paragraphs.

This lesson plan was prepared for Geography Awareness Week by:

Dr. Douglas C. Munski
University of North Dakota Geography Department

Edible Wild Plants of Canada series, volumes 1-4, National Museum of Natural Sciences, National Museums of Canada, Ottawa. Complete series by Nancy J. Turner and Adam F. Szczawinski. Price $12.95 per volume, Canadian dollars.

No. 1, Edible Garden Weeds of Canada. 1978. pp. 184.
No. 2, Wild Coffee and Tea Substitues of Canada. 1978. pp. 110.
No. 3, Edible Wild Fruits and Nuts of Canada. 1979. pp. 212.
No. 4, Wild Green Vegetables of Canada. 1980. pp. 177.

In the Edible Wild Plants of Canada series. the authors describe selected plants commonly found in Canada. The plants are arranged into four major categories and a separate volume is devoted to each category. Each volume follows the same format and the introductions outline the content of each volume. The authors generalize about the gathering and preparation of plants, caution against improper plant identification and warn of plants to avoid. The common, scientific and family name, the description, geographical range, uses and at least one recipe is given for each plant. The authors have provided in each volume a glossary of plant related terms and a bibliography for readers who are interested in additional references on the topic. Each volume also contains an alphabetized index for convenience in locating plants within the book.

These books are not meant to be technical and have been written for the layperson's use. They are well organized and are serviceable to the reader. The addition of recipes is a positive attraction to the series because they help the reader understand how a plant could be utilized. This also gives the reader a chance to experiment with and taste the plant. The glossaries are helpful because they allow the reader to become more familiar with botanical terminology.

One problem with the books in this series is that only a few of the plants are represented by color photographs. Others are illustrated by sketches that are unclear and unfamiliar plants would be difficult to identify. Barring these minor illustrative problems, the Edible Wild Plants of Canada series would be beneficial in learning how to utilize wild plants and is recommended to anyone interested in Canadian ethnobotany.

University of North Dakota, Grand Forks Shelly Hoganson

Landscape Ecology. Richard T.T. Forman and Michel Godron, John Wiley & Sons, New York, NY, 1986 (price not set). XIX + 619 pages.

Readers of _Landscape Ecology_ are led to believe this textbook will tread onto a new road in ecological studies. This message is hard to miss. In the foreword Carl Steinitz (Harvard University) states, "The book outlines a powerful model -- a spatial language for analysis ... It opens the possibility of taking a more comprehensive and synergistic view of ... ecology." One soon realizes this is indeed an innovative, original and exciting work. Its premise is that landscapes exist in disturbed and undisturbed forms. Moreover, nature itself can initiate a disturbance. The focus of _Landscape Ecology_ is the presentation of "many concepts that help tie the field of landscape ecology together." Recognizing that these concepts are tentative, "reflecting the growth phase of the fields." They cite literature that supports major statements and conclusions throughout the text. When previous studies studies are not available, the authors offer possible answers, even cueing with hypotheses. This work is an asset to the existing literature.

Overall organization is logically sound. The reader is led throughout by a discussion of what is known and what it implies. Chapters one and two discuss landscape perceptions, and ecological concepts, respectively. Chapters three, four, and five address landscape structure using the terms patches, corridors, surrounding matrix, as descriptive classes. Chapter six ties these ideas together introducing size and heterogeneity as key landscape characteristics for further discussions. Geologic influences and time are introduced in chapter seven. Human influences and modifications are presented in chapter eight. Chapters nine, ten, and eleven examine the functions of energy and matter flow, as well as speciation. Patterns of landscape change are discussed in chapter twelve. Chapters thirteen and fourteen examine landscape applications: typology or classification and management. Each chapter concludes with a summary and student questions. A glossary of terminology is included.

The strength of the text is in its innovative approach, a spatial analysis of ecological concepts. Nothing is apparently omitted. Diagrams, photographs, and other visuals are clear and appropriate. Photographs are good and large enough to be easily viewed. Weaknesses belong to the publisher. Several tables and figures are placed side ways in the text, and are irritating to the reader. It is suggested by this reviewer that the book's dimensions (height and width) be modified to suit those of the material in its next printing.

This book turns a corner in ecological literature. It seems best-suited to the college level, either used on a very basic introductory level, or saved for the senior and graduate levels where scientific foundations are better understood. Overall, _Landscape Ecology_ is exciting, well-written, comprehensive, and international in scope.

University of North Dakota, Grand Forks Robin Odom Rapai

Alberta Plains Prehistory: A Review. J. Roderick Vikers, and Dog Days in Southern Alberta. Jack Brink, Alberta Culture: Historical Resources Division, Archaeological Survey of Alberta Occasional Papers Nos. 27 & 28, 1986. 210 pages.

The following is a review of two monographs, published together in one volume by the Alberta Culture: Historical Resources division. The papers were written for specialists rather than the general reader, and aat times may seem jargon laden and difficult to read. Individauls interested in archaeology, and the prehistory of Alberta and the Northern Great Plains in general, will find these works valuable. Together they give the reader a summary of the tools available to researchers reconstructing the prehistoric cultural geography of a region. The Survey of Alberta Occasional Papers are distributed free to interested professionals and universities and may be found in many university libraries.

Alberta Plains Prehistory: A Review, by Vickers, examines the archaeological record of the region. The work chronologically defines periods, phases, and complexes by the type or style of period, phase, or complex with sites he feels represents them, including descriptions of artifacts, faunal materials, and necessary paleoenvironmental data. The last comprehensive history of the archaeology of Alberta was published in 1965. Many sites have been excavated and new artifact analysis techniques have been developed since that time. Using recent evidence, Vickers critically reexamines theories proposing the existence of pre-projectile-point Indians and their role in the extinction of Pleistocene megafauna. The monography includes maps, tables, drawings of diagnostic artifacts and an exhaustive bibliography that should help the interested reader with future research.

Dog Days in Southern Alberta, by Brink uses linguistic evidence contained in the journals of fur traders to reconstruct the position of tribes in the Alberta plains at the time of the first contact with Europeans. In the title Vickers refers to dog days as the period before the introduction of the horse to the plains, when many indigenous groups used dogs as pack animals. Southern Alberta has been traditionally thought to be the territory of the Blackfoot, but Brink argues that they may have been relatively recent immigrants into the region. He proposes that parts of the region were occupied by the Kutenair, Gros Ventre, and Snake Indians during the protohistoric period. The essay concludes with a discussion of how archaeological evidence can be used to solve the problem of identifying prehistoric ethnic groups.

University of North Dakota, Grand Forks Daniel Livdahl

Plains Indians Natural Science. Mary E. Bluemle. Grand Forks: University of North Dakota, 1985. 64 pages. $2.10.

Developed as an introductory natural science text for Native Americans at the university level, Plains Indians Natural Science includes a general discussion of several disciplines. Dr. Mary E. Bluemle states that Indian students often have difficulty adjusting to the social, cultural, and academic demands placed on them at the university level. To offset this, a teaching model was needed. Her model presents necessary information relating to the natural science of the Northern Plains, and in particular, to the natural science of North Dakota.

Dr. Bluemle begins with an overview of North Dakota geography, climate, soils, landscapes, and biology. Although the information presented on each topic is brief, it does provide a sufficient introduction and serves as a basis for understanding the interrelationship that existed between the environment and early humans in North Dakota. The first section of the book was completed by indicating the various Indian tribes that inhabited the Northern Plains and by providing a short statement concerning their culture and approximate period of occupation. In the second section, Dr. Bluemle presents a more intimate description of the geology, flora, and fauna of the Indian reservations located in North Dakota. Specifically, these are the Standing Rock, Turtle Mountain, Fort Berthold, and Fort Totten reservations. These capsule descriptions serve two purposes, (1) they provide an opportunity to expand on the information presented earlier in the book, and (2) they give Native American students the opportunity to learn more about their home reservation.

To help students retain what they have learned in the book, Dr. Bluemle provides two appendices. Appendix I lists road logs for road field trips in a designated area of each reservation. By giving directions and mileage from a known starting point, the author points out and explains various landscape and geologic features. Appendix II presents a short history and legal background of the establishment of North Dakota reservations. .

Many Indian Studies departments around the country are searching for suitable texts that could be utilized in their programs. While PLAINS INDIANS NATURAL SCIENCE is geographically limited, it can serve as a model for those departments seeking direction. By developing a program specifically fitted to their locale, professors can help Native American students revive that strong sense of identification with the environment endemic to their culture.

University of North Dakota, Grand Forks — Kenneth C. Dagel

Main Street to Miracle Mile. Chester H. Liebs, Little, Brown and Company, Boxton, 1985. 259 pages. Price 15.95.

Chester Liebs recent book, Main Street to Mircle Mile is destined to become a classic among cultural geographers interested in the American built landscape. He has done what no other author has been able to do before him --- concisely trace the evolution of roadside architecture in this country.

Over the past eighty years of American history, the country's visual landscape has been dominated by accomodations to the automobile. The author carefullydocuments changes in roadside architecture from the horse drawn era, through the street car decades and finally, to the automobile era. The automobile has become a universal experience for Americans and as a result we can all relate to Liebs insights. The brillance of this book lies in the fact that the author has clearly established an easily identifiable typology of roadside architecture. In doing so, Liebs communicates with both scholars and laypeople alike through the use of excellent historical illustrations and photographs.

The book is organized in a sensible manner beginning with the evolution of the "strip" from the traditional mainstreet setting to what the author calls "architecture for speed-reading." Amazing he uses the entire country as his study area. Liebs further discusses the images associated with the automobile moving from the past to the present and includes photographs of early "automobile liveries" to modern high tech gas stations. He devotes individual chapters to the evolution of auto showrooms, supermarkets, miniature golf courses, drive-in theatres, motels, restaurants, and gas stations. This information would be invaluable to anyone attempting to document their own local examples of roadside architecture.

Although Chester Liebs includes some beautiful color photographs, there are no maps, statistical information charts, graphs, or tables to help the author document his findings. This is a minor flaw in what is otherwise an excellent book. Liebs book is written in a non-pretentious way and will appeal to a wide variety of readers. It has almost universal application to all those places where the automobile has shaped the built environment and is a pioneering study which synthesizes a massive amount of information in one book. Chester Liebs book, Main Street to Mircle Mile is a truly enjoyable trip.

University of North Dakota, Grand Forks James R. Schimmer

Tourism Development. Douglas Pearce. Longman Inc., New York, 1985. 112 pages.

Tourism Development from the Longman Series, Topics in Applied Geography, provides a systematic approach to the study of tourism development, one of the fastest growing industries in the world. As the author states "the aim of the book is to give students a basic framework and methodology with which they can further explore this fascinating and important field". For those who have no background in the subject, the book provides an introduction to tourism development with a clear, concise and readable text.

The introductory chapter presents readers with a model of the spatial dynamics of tourist space, a useful starting point for the systematic analysis of tourism development. Chapter Two addresses the structures and processes of tourism development. Chapter Three examines the various locational factors influencing tourism development. Chapter Four discusses the various impacts of tourism development. Chapter Five considers spatial planning for tourism and Chapter Six examines two case studies based on the author's own research. The first case study describes how Queenstown, New Zealand has developed from a regional holiday center to one of the country's foremost resorts. The latter examines the development of Languedoc-Rousillon, one of the largest and most ambitious tourist development operations ever undertaken in Southern France.

Pearce illustrates his arguments with a number of examples from various places, but the emphasis tends to be generally oriented toward the United Kingdom and Europe. Perhaps the author could have broadened the geographical scope of his book by using more examples from North America.

For students and teachers of geography, Tourism Development is an excellent and informative introductory source. The book also would be of value to students of economics, business administration, planning, sociology and those professionally involved in the tourist industry.

University of North Daktoa, Grand Forks Kari Brekke

STATISTICAL TECHNIQUES IN GEOGRAPHICAL ANALYSIS. Gareth Shaw and Dennis Wheeler. John Wiley and Sons Ltd., New York, New York 1985, 356 pages.

Statistical Techniques In Geographical Analysis was designed and written for teaching quantitative analysis to undergraduate geography students. The authors' premise is geography students have a limited mathematical background; therefore, only essential theory should be introduced. The authors feel strongly that since most geographical problems are multi-variable in nature, computer applications should also be stressed. One entire chapter is set aside as a summary of several computer programs which perform statistical analysis.

This book is written as an introduction to statistical analysis. The first four chapters provide a solid foundation for the basic statistical measures: the median, mode and mean, which are discussed in detail within chapter five. Chapters six and seven are devoted to probabilities and their distributions. Chapter eight introduces the concepts of samples and populations. Chapter nine defines hypothesis and describes hypothesis testing. Chapter ten deals with correlation analysis. Chapters eleven, twelve, and thirteen study regression: linear, nonlinear, and multiple. Chapter fourteen studies data classifications and groupings. Chapter fifteen is concerned with factor analysis and related techniques. Chapters sixteen and seventeen study spatial indices and trend surface analysis respectively.

Shaw and Wheeler are excellent writers, and they have produced an exciting and well written documented book. One of the strengths is the inclusion of sample problems within the text. In addition, some of the chapters have review problems at the end of the chapter. It may have been beneficial to include an answer section in the back of the book for students to check their work. Additional problems should have been included in the chapters which have none for better balance and to encourage the student to master the concepts along with the techniques presented.

This book would be a useful reqired book any class on quantitative methods in geography. At the end each chapter, the authors provide bibliographies for sources cited, and a recommended readings list which includes a short summary of subjects covered.

University of North Dakota, Grand Forks Roland C. Mower

Afghanistan: The Soviet War. Edward R. Girardet. St. Martin's Press, New York, N.Y., 1985. 259 pages. $19.95.

On Christmas Eve, 1979, with the Western world safely preoccupied by the holidays, the Soviet Union invaded Afghanistan. Since this initial assault on the liberties of a fiercely brave and proud people, the Soviet Union has found itself embroiled in what has become one of modern history's most inspiring yet tragic David and Goliath epics. Afghanistan: The Soviet War is both an historically investigative and up-to-date work weaving events before, during, and after the invasion into a trenchant narrative made all the more revealing by the author's myriad and judicious insights into a nation so diverse and contradictory as Afghanistan. Mr. Girardet is well-qualified to bring such an important and sorely neglected conflict into focus, having travelled to Afghanistan twice before the invasion, and six times since -- five of these journeys having been dangerous clandestine trips to the resistance-controlled interior. His knowledge of the country and its people, politics, and ethnic/religious contrasts is impressive. Moreover, Mr. Girardet's ability to meld each study of Afghanistan's character into a piercing evaluation of the intricate cross-currents running through an occupied nation facing civil disintegration is illustrative of the author's insight and empathy.

Afghanistan: The Soviet War is a gripping view inside a ravaged country fighting for its very survival. As the author notes, "In what amounts to a calculated policy of migratory genocide, the Soviets have forced between one quarter and one third of the Afghan population to flee abroad." The Afghan people, having defended their homeland for centuries against such outsiders as Genghis Khan and the British Empire, are now confronted by an entirely new set of circumstances in which the Soviets observe no rules in their drive to subjugate an Afghanistan where "Entire communities have been massacred or ruthlessly ravaged by Soviet and Afghan troops, while tens of thousands of political opponents...are incarcerated and tortured in government jails, many of them never to emerge alive

Mr. Girardet, currently a correspondent for the Christian Science Monitor, paints a stark picture of events in Afghanistan, based largely on his "own reporting, the reporting of other journalists, testimony from the French doctors, and interviews with diplomats, relief agency representatives, Afghan government defectors, resistance sources and refugees..." Overall, the author maintains a noteworthy degree of objectivity in his writing. Nonetheless, Mr. Girardet has the probity to state the limits of his journalistic sensibilities in authoring this work: "As a journalist and fellow human being who has lived, travelled and shared common experiences with the Afghan resistance, it would be dishonest of me to claim that this is a totally impartial appraisal. Victims of what I consider to be a brutal and colonialist form of repression by the Soviets, the Afghan people have all my sympathy."

University of North Dakota, Grand Forks — Edward S. Hout

Famine: A Man-Made Disaster?. Independent Commission on International Humanitarian Issues, Vintage Books, New York. 1985. viii and 160 pp. Maps, Diagrams and Appendices. $4.95 paperback.

Famine: A Man-Made Disaster?, a recent, comprehensive report of the Independent Commission on International Humanitarian Issues (ICIHI), focuses on the climatological, agricultural, economic, cultural, and political factors that brought about famine in the sub-saharan region of Africa. Straightforward in emphasizing these factors it provides perspective into the changes that have occured in post-colonial Africa that have brought about a system that can no longer feed her people.

Each of the book's nine chapers deals with a different ingredient of the African famine formula, concentrating on the Sahel zone and the Horn of Africa. The early signals of famine such as localized famine, general food shortages, and migration of rural people to urban centers are some of the themes that many of the chapters emphasize. These demographic effects, cultural and economic, are broadened to include the less visible but ultimately important results of famine such as food production ownership, purchasing power and foreign debt. The role of foreign aid, its misuse, and international power peddling also are discussed. Politics, artificial frontiers, forced migration and civil wars, as causes of famine and the political ramifications of these factors are acknowledged, too. These factors, along with the flux that the modern economic system has imposed on traditional Africa, gives the content of the book a broad base.

In general, the report takes aim at ineffective, inefficient agricultural relief programs, international and domestic, that failed to work, and how post-colonial cultural and economic change has disrupted a precarious balance between man and nature in Africa, and how that imbalance has led to famine.

University of North Dakota, Grand Forks Todd Leake