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THE WIFE'S PROLOGUE AS ROLE PLAYING

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Ever since Chaucer created the Wife of Bath, she has taken on a life of her own. The sheer length of her own Prologue serves as a realistic portrayal of a person who talks too much, of one who simply takes too long to get to the point. As the Friar exclaims, hers is a long preamble to a tale (1. 837), and the modern reader tends to agree. Her Prologue is almost twice the length of her story and longer than the total of the introductory material to all the stories in the Canterbury cycle (Sedgwick 1934:263). Perhaps Chaucer allowed her to ramble on so long because even he became seduced by her astonishing complexity and lifelike autonomy. Of all the Canterbury Pilgrims, she is the one Chaucer refers to by name in his other poetry, as when he tells Bukton on the subject of marriage to *rede the Wyf of Bathe* (Robinson ed. 1961:539).

In this century alone the Wife has gone through several stages of interpretation. She has been seen as a one-dimensional figure, with a storehouse of medieval learning (Shumaker 1951); as an iconographic character made into a vehicle, or a butt, of antifeminist satire (Robertson 1962; Weissman 1975); as a woman whose speech shows she is in contention with the mores of her world (Schauber and Spolsky 1977); and most recently as a case study in neuroticism (Fritz 1980). Even the literature on the Wife has spawned a literature. Sands, for example, has a whole article comparing the views of critics on the Wife's personality, with only a passing glance at the primary source itself (1978).

But far too much of what has been said about the Wife is based on the substance of her report, often in isolation from the literary construct in which she is portrayed. Almost no one has testified to the dramatic properties of the Wife's discourse. No analysis of Dame Alison will be definitive unless it views her lines not as a text, but as an act. No critical assessment will be complete until it sees the Wife as being the speaker of lines, the player of parts, the central figure in a well-contrived dramatic monologue.[1]

Our ears should be able to make out the surface markers that give the Wife's lines the sound of talk. There is the colloquial "these" for a familiar referent, in *Thise wormes ne thise motthes ne thise mites* (586). Now we have been cautioned against concluding that a medieval character's syntax is "chaotic" simply because it is not like our own, since Chaucerians did use a different and apparently more colloquial syntax in their poetry than we do (Roscow 1981:1-9). Still, a number of syntactic shifts seem to be idiosyncratic to characters, as the shift from "us" to "she" in *Some for oure shape, and some for oure fairness, / And som for she can outher singe or daunce* (264-5) (Schlauch 1952). Other shifts in number (400-401, 568, 698) may not be salient only because they are integrated so naturalistically in the Wife's speech. There are numerous imperatives like *Now herkneth hou I bar me proprely* (230), most of which are superfluous because they command speakers to do something they are already doing, or do not need to do, but function as vocal indices of insistence. Emphasis comes from the frequent use of "will" in lines like *For sith I wol not kepe me chast in al* (52) and of double negatives,[2] like *I ne owe hem nat a word that it nis quit* (431). Other lines are intensified by vocal idioms, like *by my trouthe* in *For, by my trouthe, I quitte hem word for word* (428), which underscore the Wife's resolve to fol-

low her own inclinations. Certain set phrases and set expressions, including proverbs, which occur so often in the Wife's talk are not just filler; they are what Ong calls *oral formulae,* marking discourse as having descended patently from an oral culture (1982: 26). Part of this complex are the oaths, like "God knows" in *For God it woot, I chidde hem spitously* (229), that in Alison's talk ironically call on God to witness her most un-Christian activities: her indulgence in fleshly pleasures and her tyranny over her husbands. Other indices of vocal strengthening are Alison's exaggerations, as her claim that she told everything to her confidante about her husband, even if he "did something that would have cost his life" (541); and the strength of language she uses in her sweeping dismissals, those one-or-two-liners, some blistering with invective: *With wilde thonder-dint and firy levene/ Mote thy welked nekke be tobroke!* (282-3).

The Wife's recourse to word play substantiates Chaucer's remark that she has a talent for laughing and talking in company (GP 476). There is the use of *dighte* in the senses of both 'copulated with' and 'dressed' in *t'espye wenches that he dighte* (404) and aside from *double entendres,* numerous puns [*flour* (119, 483), *ba* (439), *leek* (578), *croce* (490), *daungerous* (520)],[3] and those coarsely figurative expressions, like having 'delight in bacon' (424) which pass for "country talk."[4]

One item occurs so repeatedly that the hearer cannot but conclude that the Wife is preoccupied by the idea. The phrase *bere on honde* has as its primary sense 'to govern,' and as secondary senses 'to convince,' and 'to accuse falsely.'[5] Its frequent use (232, 238, 333, 386, 399, 581) is an index to the Wife's character, since it reflects how she sees herself in relation to her husbands: *thus . . . bar I stifly mine olde housbondes on honde* (385-6). Colloquial and physical, the idiom illustrates her propensity for having her husbands in her grasp; it shows her desire to dominate. The phrase is probably intended to be accompanied by a manual gesture. As such it functions as a stage direction, a way of establishing a setting in words, like Alison's reference to the "tun" the Pardoner is drinking from at the time (176).

It is in fact when we hear Chaucer's lines read by an actress that we become aware of how much they were designed for oral delivery. An example is lines 9 to 25 as read by Dame Peggy Ashcroft:

> But me was told, certain, nat longe agoon is,
> That sith that Christ ne wente nevere but ones
> To wedding in the Cane of Galilee,
> That by the same ensample taughte he me
> That I ne sholde wedded be but ones.
> Herke eek, lo, which a sharp word for the nones,
> Biside a welle, Jesus, God and man,
> Spak in repreve of the Samaritan:
> "Thou has yhad five housbondes," quod he,
> "And that ilke man that now hath thee
> Is nat thyn housbonde." Thus saide he certain.
> What that he mente therby I can nat sayn,
> But that I axe why the fifthe man
> Was noon housbonde to the Samaritan?
> How manye mighte she han in mariage?
> Yit herde I nevere tellen in myn age
> Upon this nombre diffinicioun.[6]

In line 9 we hear the voice begin low, remote, with a quality of wonder, and rise to the incredulity of *ne . . . wedded be but ones.* Then there is a break. With *Herke,* we hear a tone of querulousness, as the speaker passes into the second Biblical text, now moving more quickly through the quote as she builds to the climax. This is followed by a half-line, in a tone of childlike assurance, *Thus said he certain,* as if the speaker wants to testify to the fact that the strangest stuff does occur somewhere in Scripture. There is a sudden modulation, the lines afterward taking on different voice qualities in quick succession. *What that* is delivered with flippant jocularity. *But that I axe* is impatient. The two following questions are insistent. There is a break. The kicker then comes with the voice, now stretched to encompass all the Wifely experience, climbing to an authoritative ring, and then, with the word *diffinicioun,* the voice drops to the hint of a giggle. This

quality of recitation, which enhances meaning and gives the impression that Alison is enjoying her own lines, is a tribute, of course, to the probity of the actress. But the fact that Chaucer can provide the literal basis for tonal changes, and thus for shifts and starts of feeling, shows that our full appreciation depends upon our tuning in upon Alison speaking.

As indicated above, *insisting* is one thing the Wife does, but she is also engaged in *confiding, arguing,* and *challenging*. These are the speech acts of the Wife, as identified by Schauber and Spolsky (1977:26), who conclude, "The overwhelming message we receive from Alison's Prologue is of her incessant struggle with the givens of her world, her indomitable revisionism, subversion, reordering." The writers hold that distinguishing her speech acts is a major way of "knowing" a character. It can also be held that the theory of speech acts, when applied to literature, aids us in knowing the text as well, for we then assume that the text is not merely words but part of an action intended by a speaker to have an effect on a hearer, however fictional they both are. There are indications, even surface features, that the first and second persons are foregrounded in Alison's lines.

The 17 or so questions that occur in the Wife's address to the Pilgrims all have the effect of drawing the hearers into her discourse. The earlier ones, those before line 168, like *How manye mighte she han in mariage?* (23) do give the Wife a tone of contentiousness. The later ones, however, like *What sholde I say?* (633) and *woostou why?* (568) momentarily halt and reverse the flow of her *confessio,* and thereby lend it some liveliness. The same quality comes from the exclamations she makes on her subject. There are the irreverent outbursts like *Which yifte of God hadde he for alle his wives!* (39), and asides like *Ye woot wel what I mene of this, pardee* (206), this one a leering reference to her old husbands' impotence while she tells how she taxed them. Once she interrupts herself to show her feeling of outrage: *Fy! speek namore—it is a grisly thing* (741). Here it is almost as if the Wife is briefly taking on the role of hearer of her words. A later couplet has her pulling herself back from mental rambling in the words, *But now sire—lat me see, what shal I sayn?/Aha, by God, I have my tale again* (591-2). In addition to these features of spontaneity are those that indicate the Wife's side of the interaction with the audience. A whole succession of first person pronouns may occur within a short space: *I wol . . . I nam . . . wol I . . . If I . . . me . . . My housbonde . . . wol I, I wol . . . my dettour . . . my thral . . . I am . . . I have . . . al my life . . . unto me* (154-66) all within 13 lines. Other lines show Alison personalizing the scriptural texts and proverbs, as 'Paul told me' and 'Christ taught me' (166, 12); *God bad us for to wexe and multiplye;/That gentil text can I well understonde* (28-9). Muscatine has remarked that the Wife "swallows" whole Biblical texts into her monologue and adapts them to her personality (1966:209). The rather frequent occurrence of the subjunctive is explained in that Alison continually inserts her own feelings into her lines: *the devel go therewith!* (482), *God his soule blesse!* (531), *Blessed be God that I have wedded five* (44). In these passages the interruptors,[7] the asides, the questions, all underscore the Wife's involvement in her material, imposing her personality on it, as well as stress her consciousness of an audience.

And the audience that Alison is in transaction with, the Canterbury Pilgrims, is one which, according to Kittredge, is taking a "lively interest" in what she says (1911-12:440). So compelling is her discourse that it actually provokes someone to respond, as when the Pardoner interrupts with his comments on his intended marriage. The audience contracts briefly to the "young man" alone whom the Wife addresses, assuring him she will warn him away from matrimony. At another point the Wife's concept of audience seems to shift to a class of people who are not on the Pilgrimage, those to whom she wants to confide the wiles

she uses to keep men under dominance: *Ye wise wyves, that conne understonde,/Thus sholde ye speke and bere him wrong on honde* (231-2).

The dramatic monologue derives its quality from a person's speaking in a well-defined situation, conscious that she is before an audience. The person is in transaction with one or more listeners. The person is portrayed as a character by being caught in the act of revealing herself, with all of its implications for unreliability and dramatic irony. The speaker is dynamic, changing in time, becoming more and more complex as she reveals herself to us, and as we undergo successive realizations about her.

The unreliability of the Wife as a spokesperson is manifested by a number of rhetorical features. Readers have already commented on the distortions Alison gives to the Scriptures, especially to the Cana text and to the Samaritan woman *exemplum*[8] She then mounts a suspect analogy, on the issue of successive marriage, between the Biblical patriarchs (who were populating the earth) and herself (who never admits to having children). This, when it is concluded with her leering over the prospect of Solomon's wedding nights, must have made her hearers smile.

Alison's numerous repetitions serve to stamp a quality of spontaneity on her lines. She overuses the terms *bigamye* (33-102), *chastitee* (100-147), and *purvey* (566-91), and she belabors the notions of virginity (65-98) and procreation (121-43). As a debator she relies distinctly more on rhetoric than on logic. Whereas she claims to defend remarriage, she really defends the state of marriage. Whereas she has begun by insisting virginity is not obligated, she at length holds that she will not oblige procreation. Both assertions are a manifest shifting of the grounds of her argument.

Other features show that the Wife has not carefully edited her speech, mainly those instances of digression. She announces that she will speak from experience, and then undertakes a tour of the authorities. She refers at the outset to the *wo* in the wedded state (3), and does not arrive at the subject until about 200 lines later, after the Pardoner's interruption pulls her back. Then she promises to tell her *tale* (178, 199), but it has to wait. At line 458 Alison says she will speak of her fourth husband. The 30 or so lines that follow furnish us with an exposé rather of the Wife, her appetites and the loss of her beauty. She tries again. In line 486 she embarks on the subject of her fourth husband, but she actually explains what treatment the man got at her hands, purgatorial, and how stingily she buried him. In line 509 she moves on to her fifth husband, but then she really recounts how she courted Jankyn when her fourth was still alive. At this point she becomes so diverted by her anecdote of the fictive symbolic dream that she must catch herself from betraying something dangerous.[9] Finally, after illustrating her new husband's obnoxious habit of reading to her from the clerkly writings, she departs into a disquisition on clerks (694-716). By the end of her 834-line monologue she is again announcing her *tale.*

Among the more obvious dramatic features in the Wife's Prologue are those instances of exhibitionism. She demands the attention of others through histrionics: *Allas, allas that evere love was sinne!* (620). She climaxes her account of her marital experiences, and of her Prologue, with a line more melodramatic than any in the *Tales: O hast thou slain me, false thief?* (806).

When Alison cites others, she either gives her own digested version of the authorities or, with the exception of Jankyn's final lines, quotes herself. When she relates to the audience her confrontations with her husbands, all the lines are her own. She accounts for her husbands' words only in the report she makes of them in her sample of invective against her husbands. She punctuates her lines with *thou saist,* probably to keep the hearers aware that the accusations are consistently to be attributed to her

husbands. She then abruptly dismisses the accusations, and thus her husbands, with steaming epithets. Here Alison is claiming the prerogative of the dramatist, in assigning lines, and that of the stage director, in disposing of the characters at will. As it happens, she has all the lines and she has the last word; she seems to be enjoying herself at her absent husbands' expense.

Now it is one thing to claim that the Wife's lines ramble and another to claim that her Prologue is disunified.[10] If the Prologue seems to lack unity, the impression comes only from viewing the content of the work and not the act the speaker is engaging in. There is a source of esthetic integrity in the succession of revelations the Wife gives to her listeners. They would first be familiarized with Dame Alison from her portrait in Chaucer's General Prologue. From this she appears as a type figure well known to medievals. She derives both from the character of La Vieille, the old lady, in The *Romance of the Rose,* who knows all the intricacies of amorous love, and from the type of the much remarried wife, "liberated," uninhibited about acting out in company (Rowland 1972:385). There are several clear references in her own Prologue keyed to her portrait in the General Prologue: her dress, her deafness, her gapped teeth, her being remarried five times, and her craft at seduction. Chaucer then adds elements to the Wife's character that serve to pull it away from the medieval stereotype. She launches into the subject of her frequent remarriage, a sore point among medievals, and so reveals herself to be assertive, argumentative. Here she adopts the role of *disputant.* She then promises to inform her audience of the hardships of marriage, but she really intends to inform wives from her own experience on how to keep the upper hand when they are accused by their husbands. The martial quality of her temperament, by which she has sought at all times to dominate her husbands, emerges. She has assumed the role of *domestic tyrant.* At this point while the Wife reveals she is strong-willed, she testifies to a powerful acquisitive instinct. It bristles in her many proverbs, with their mice that have more than one hole, their hands that lure hawks, their people who are the first to grind at mills. These and the ruthlessly commercial diction she applies to the marital arrangement, *paye his dette* (159), *dettour* (161), *raunson* (417), put the Wife in the role of *exploiter,* of opportunist who sees life as a series of business transactions for which she must be prepared. She has already given utterance to her promiscuity, with imagery variously comparing herself to a magpie, a nightingale, a colt, but it is in the later part of her Prologue that she reveals her erotic drive. She makes it clear that she has remarried most recently for this reason—out of the Venus instinct in her character. But this is directly in conflict with the desire to dominate, and this desire overwhelms her in her role of *lover,* so that the Wife then recounts her achievement of mastery over Jankyn. Chaucer seems to be presenting successive stages in our apprehension of the Wife's character almost as if he were peeling away the layers of an onion.

The Wife, then, is a dynamic figure, not of one who undergoes change quite so much as one who brings about change in her audience's awareness of her. What listeners earlier hear as defense of a life style, they now hear as lusty venturesomeness; what they earlier hear as resourcefulness, they now hear as exploitativeness; what they earlier hear as bold assertiveness, they now hear as aggressive self-interest.

This is not to say that the various roles the Wife assumes are mutually exclusive. Alison, who is complex, can play multiple roles. For instance, at the point when she passes from disputant to domestic tyrant (192), she disclaims all seriousness, and says her intent is for *to pleye.* The diversity of her character may in fact be the diversity of an abnormal personality. Recent psychological analyses of the evidence in the Wife's lines

show that she is an authentic case study in neuroticism It is the neuroticism of the person who can at one moment speak in jest and at another disclose that she has somehow driven her husbands to the grave.[11]

Thus the integrity of the Wife's Prologue comes from the speaker's dynamic quality, a quality which is vital to the dramatic monologue: a character changes, or the audience's apprehension of a character changes, as the character gradually reveals himself. And as the audience for Browning's "My Last Duchess" modifies its estimate of the Duke, while he shows himself capable of more and more drastic measures to maintain his dominance, the listeners have an analogous experience as the Wife of Bath reveals herself more and more ruthless in the pursuit of her instincts.

For like Browning's Duke, the Wife is not to be trusted in what she reports of her life.[12] Of the many contradictions in the Wife's Prologue which she is unaware of, are these. Alison says that God commanded us to increase and multiply (as a defense of her marital yearnings), but nowhere does she admit to having borne children. She claims that she wants to live in a way that is little less than perfect, but she reveals that her appetites are wholly undisciplined. She says that she will comply with her husbands' sexual desires at any time, yet she later states that she would never satisfy her husband without a price. Her open confession of her marital tactics confirms the very accusations she claims clerks make scurrilously against women. The crowning contradiction of course is that Alison cherishes the memory of the period when Jankin was not to be mastered, but she claims that all was idyllic in their marriage only when he submitted to her.[13]

Such contradictions, when they are expressed by a character seemingly unaware of them, are the stuff of dramatic irony.

Another ironic element, which is situational, but which is compounded (because it is not recognized) into dramatic irony, comprises the reversals working through the Wife's Prologue. If she is standoffish with her husbands, she holds, may God give her sorrow. In fact she is standoffish, and in fact she comes in for a share of grief. She reveals that when she married Jankyn she turned over her possessions to him (636-7), a reversal of the situation of her prior marriages, one which she never quite realizes (Dempster 1959: 81). Then, we recall that the Wife earlier reminisces on the grief she has caused her husbands, in the line *O Lord! the paine I did hem and the wo* (390). Later she repeats the words, but in their mirror image form. Nothing so clearly underscores the reversion upon self of the same grief, now done her by Jankyn, than this line: *Who wolde weene . . . The wo that in myn herte was, and pine?* (792-3).

Readers do not tend to think of the Wife of Bath's Prologue as dramatic monologue. A look in Hugh Holman's *Handbook of Literature* (1972) under the entry *dramatic monologue* turns up illustrations of the genre in citations from Tennyson, Browning, and more recent poets, but Chaucer is not mentioned. Still, it is in her role playing that the confrontation emerges between the Wife of Bath and her world, and between her and herself. And it is in her speaking roles that we can account for Alison's boisterousness, her indomitability, her rampant individualism, her carnality, her acquisitiveness, her neuroticism, and her fascination with that last young man.

Notes

[1] *The Norton Anthology* (1975) is used for all citations to The Wife's Prologue.

[2] Rifaterre holds that the reality of a stylistic device is proved by its existence in a convergence with another feature of style (1959:172-3). Certain convergences, especially of *wol* with double negatives, seem to be stylistic indicators of assertiveness on the part of the Wife.

[3] The puns are explicated in MacLaine (1964:110-12). Also see Sanders (1968:192-5).

[4] There is a publication of such rural expressions, though many of the submissions come from the city: Dick Syatt, *Country Talk* (Secaucus, N.J.: Citadel Press, 1980).

[5] Duncan gives a concordance for *honde* as it occurs in the Wife's Prologue, which includes the senses cited (1966).

[6] Caedmon TC 1101, 1961.

[7] Muscatine writes that exclamations like *Herke eek* serve as well to "refresh the illusion of speaker and actual audience" (1966:209-10).

[8] Preston (1952:242); Speirs (1967:137-8) points out that the Wife misapplies quotations, ones especially from the Bible. Also, Bradley observes that the Wife garbles the Scriptural and sermon literature (1956: 625).

[9] There is a clear sign here of the fact that Alison and Jankyn were accomplices in the murder of the fourth husband, as explained by Rowland (1973:277). Sands (1973:179) corroborates this interpretation.

[10] Rowland reports this allegation (1972:385, 393).

[11] See Rowland and Sands above in 9. Fritz (1980:171) explains that an animus-possessed woman such as the Wife is quite capable of driving a husband to death by sickness or accident.

[12] Parker (1970) provides extensive evidence for the Wife's untrustworthiness.

[13] See Parker (1970:98). This contradiction is explained most eloquently by Magee (1971:41-2).

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HAWTHORNE'S CHILLINGWORTH: ALCHEMIST AND PHYSIOGNOMIST

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Transformation has special significance to those poet-prophets of the American Renaissance who themselves undergo a kind of shamanic initiation to perceive in the flux of nature those forces which "weave and warp and broider at the Godhead's living garb."[1] In *Walden,* for example, Thoreau reveals the poet not only shaping his vision but being shaped by it in the creation of sacred space and in ritual purification.[2] In linking the human and divine spheres in the organic cycle of nature, Thoreau draws upon a number of sources from mystery cults of antiquity to Eastern religions for patterns of metamorphosis in a complex symbolic framework, a method also employed by major fiction writers equally concerned with changes wrought upon men by the visions they embrace—Melville's practice with Ishmael in *Moby-Dick* being a signal example. Transformation is no less significant in the writings of Nathaniel Hawthorne, whose *The Scarlet Letter* evinces great sophistication in its use of the patterns of change.[3]

This study will explore the change of *The Scarlet Letter's* Roger Chillingworth, as he descends from a high-minded philosopher to a fiend. While Hawthorne outlines the old man's transformation in demonic terms recognizable as belonging to the romance's Puritan milieu, he includes elements which clearly suggest occult frames of reference which serve both to enhance the psychological revelations of the book and to provide ironic counterpoint to the limitations of the Puritan perspective. Before exploring the roles of Chillingworth as physiognomist and alchemist, however, it is necessary to discuss the complex narrative method of Hawthorne's most famous work in terms of both the processes of transformation and the presentation of the Puritan outlook.

The Scarlet Letter is premised upon renewal of the higher faculties of its narrator, who escapes the "enervating magic" of the Custom-House which he fears "might make me permanently other than I had been, without transforming me into any shape it would be worth my while to take."[4] His restored capacity "to live throughout the whole range of his faculties and sensibilities" (p. 40) frees him from the materialism and torpid senility of the Custom-House and enables him to create the romance through interpretation of the cabalistic letter.[5] This significant change in the inner life of the artist is presented by the narrator as a figurative death, a metaphorical decapitation through the loss of his Custom-House office (p. 43). Though the narrator's playful suggestion that he writes from the grave (p. 44) has obvious ironic overtones in terms of Hawthorne's loss of position, at the same time it establishes a pattern of death and rebirth which is important throughout the romance.[6]

In a sense, through his metaphorical death the narrator takes up the position of the deceased Surveyer Pue, from whose "ghostly hand" (p. 33) he receives the central symbol of the romance along with Pue's historical researches on it. Thus, at the verge of life, in the imaginative realm which ghosts inhabit (p. 36), the artist's power to interpret the letter and to gain control over the "corpses" (p. 34) of his characters is restored. Here the artist operates in "a neutral territory, somewhere between the real world and fairy-land, where the Actual and the Imaginary may

meet, and each imbue itself with the nature of the other" (p. 36). But the Puritan mythos which underlies the action of *The Scarlet Letter* demands that the narrator deal in matters which link not only "the Actual and the Imaginary," but also the human and the divine.[7]

The romancer is seemingly thrust into the position of prophet, interpreting what appear to be the designs of Providence in the Puritan drama of salvation. But though he relies upon symbols which come out of the Puritan *Weltanschauung,* he employs them as revelatory of the human condition in this world, not the next.[8] In fact, all pretensions to prophetic offices which would attempt to see beyond that which is human meet with irony throughout *The Scarlet Letter.* The narrator provides overlapping interpretations of psychological transformations which reveal, often ironically, the depth and complexity of lived experience.[9] Elements of Christian and occult belief establish the place of the transforming power of the human imagination in history; they are discovered in a *Lebenswelt* in which imagination clothes under various guises the truths of the human heart.[10]

Presented as they are in a complex historical vision, the romance's transformation motifs rely on a code of communication which has, in common with allegory, an assumption of the reader's knowledge of religious tradition, as well as the practice of objectification of interior conflicts in symbolic terms. The romance's tragic design is enhanced by the irony of such motifs reflecting the action of human passions on a symbolic stage which transcends humanity. The narrator's objective stance gives full weight to the division between the roles characters play and their underlying humanity, a division which is significant to the tradition of the nineteenth-century realist novel as well as tragic drama.[11]

The principal transformations in *The Scarlet Letter* treat the activation of human potential through processes which include figurative deaths like that of the narrator in "The Custom-House." These are played against one another in highly controlled and balanced interactions of characters whereby change in one causes change in another.[12] Since multiple interpretations of such transformations are resolved dramatically rather than theologically, it is necessary to explore Chillingworth's metamorphosis within its dramatic context, while at the same time paying close attention to its connotative values, especially as Puritan vision is juxtaposed with unorthodox viewpoints.

Two secrets are the springs of the dramatic action which transforms *The Scarlet Letter's* principal characters: that Dimmesdale is Pearl's father, which Hester refuses to reveal before the Puritan community (III), and that Chillingworth is her husband, which she agrees to conceal during an interview in the privacy of her prison cell (IV). These, along with the symbolism associated with the Puritan point of view, are established by the romance's first four chapters, thereby providing a context in which the passions of a secret domestic triangle will be interpreted in terms of the Puritan drama of salvation.

Hester's transformation in the eyes of the Puritans is the book's first metamorphosis; the scarlet letter "drew all eyes, and as it were, transfigured the wearer," the narrator comments, "so that both men and women, who had been familiarly acquainted with Hester Prynne, were now impressed as if they beheld her for the first time" (p. 53). The term *transfiguration* in this passage connotes a mode of revelation present throughout the romance; in its broadest sense, it suggests a manifestation of that which has been present but heretofore hidden.[13] Here the community sees Hester for the first time in her role as adulteress, which is conditioned by Mr. Wilson's conventional sermon endowing the letter with infernal significance and reducing its wearer to what Chillingworth calls "a living sermon against sin" (p. 63).[14] However, the scene preserves an inward human reality as against

the abstract Puritan interpretation of sin. Hester's life as a woman has indeed entered a new stage, and as she stands before the community the young woman contemplates the path which bought her to the scaffold.

In a series of "phantasmagoric" (p. 57) scenes which Hester calls up to relieve her agony on the scaffold, she traces her childhood, maidenhood, and marriage—presumably the last public festival at which she has been the object of attention. Her marriage has offered her "a new life," but one which nourished "itself on time-worn materials, like a tuft of green moss on a crumbling wall" (p. 58). This marriage, by betraying her into a relationship with "decay" (p. 75), set the stage for her adultery in a situation not uncommon in literature and folk tale. But in *The Scarlet Letter* these circumstances are given a tragic dignity. For throughout the romance, promises of a new life offer to the characters only stronger ties with death and illusory hopes of regeneration. The tragedy of the book lies in the opposition of Hester's passions to community imperatives which are imposed upon her through an ill-fated marriage.[15] No social forms permit her to act out the full range of her "faculties and sensibilities," to put her plight in the terms established in "The Custom-House."

Just as Hester seemingly becomes another person in her transformation, so her husband is also transformed by it. As he stands by the scaffold he suppresses the "writhing horror" which "twisted itself across his features, like a snake gliding swiftly over them" (p. 61), and signals Hester to be silent. He then meets with her in prison to demand that she "Let . . . thy husband be to the world as one already dead, and of whom no tidings shall ever come" (p. 76). With her consent, Prynne becomes another man who seeks a "home" (p. 76) in his secret connection with Hester as he had in his unfortunate marriage to her (p. 74). Prynne's transformation to Chillingworth thus takes place with a figurative death. With this death he activates his potential for hatred. He announces to Hester his purpose of discovering and gaining control over her paramour, leading her to ask if the old man is not "like the Black Man that haunts the forest round about us" (p. 77). And in fact, Chillingworth's degeneration to a demon is a principal transformation of the first half of *The Scarlet Letter.* Significantly, Hester's silence permits this change, as it allows the changes in the Rev. Mr. Dimmesdale under Chillingworth's baleful influence.

Chillingworth's means of discovery of Dimmesdale's secret and his purposes in doing so are purely personal and mortal; in fact, so linked to mortality is he that his interests are presented in metaphors of death and corruption. He works his way toward the minister from outward signs which offer to him clear clues of Dimmesdale's relationship to Hester and Pearl. Mid-way through the first half of *The Scarlet Letter* (VIII), at the inquest called by the ministers and magistrates to determine Hester's fitness to rear Pearl, Chillingworth remarks upon the "strange earnestness" (p. 115) with which the young minister defends Hester's right to custody of the child. He also observes Pearl's sympathetic response to her father (p. 115), an echo of her gesture toward him on the scaffold three years before (p. 67). But when he comments upon the possibilities of discovering Pearl's parentage from her person, the Puritans recoil.

The old physician exclaims: "A strange child! . . . It is easy to see the mother's part in her. Would it be beyond a philosopher's research, think ye, gentlemen, to analyze that child's nature, and from its make and mould, to give a shrewd guess at the father?" The Rev. Mr Wilson, though he had urged Hester to reveal the child's father on the scaffold, immediately rejects the knowledge offered by "profane philosophy;" he suggests that each man ought to act the part of Pearl's unknown father, leaving "the mystery as we find it, unless Providence reveal it of its own accord" (p. 116). The Puritan's unwillingness to explore

Pearl's riddle is in keeping with the scriptural injunction to "judge nothing before the time, until the Lord come; who will bring to light the hidden things of darkness, and will make manifest the counsels of hearts" (I Cor. 4:5). Chillingworth, however, moils about in the darkness seeking to read hearts, not to bring their secrets to light, but for personal revenge.

Chillingworth's attention to Pearl's "outward make and mould" indicates that he is a practicing physiognomist, gaining his knowledge from the body. The "science" he employs, condemned in Elizabethan England, was codified in the eighteenth century by Lavater, whom Hawthorne read, and offers explanations of the physician's methods; for example, according to Lavater, "illegitimate children tend to resemble one parent more than another, which likeness may become more evident over time."[16] This is in fact one of the possibilities Dimmesdale himself fears (p. 206). In addition, Lavater proposes that parents and children have natural affinities, a belief which Chillingworth announces when he visits Hester in prison and comments that tiny Pearl will not recognize him as her father (p. 72), only shortly after the infant has made a tell-tale response to Dimmesdale.[17]

According to Lavater, the physiognomist exercises his art with a "secret delight," discerning "those internal motives which would otherwise be first revealed in the world to come."[18] Chillingworth does in fact discover what the Puritans would leave to Providence, but he is limited to corporeal signs to the point that only a physical manifestation of the letter on the minister's person provides him with certain knowledge of Dimmesdale's guilt. Because Chillingworth has no higher motive than his quest for personal revenge, he is mired in the mortality which his vision comprehends. The new life which the old man adopts through his figurative death is allied to decay, and in the moral sphere his actions transform him into a "fiend."

The second quarter of *The Scarlet Letter* traces the effects of his quest for and discovery of Dimmesdale's secret upon Chillingworth himself (IX, X), and upon the unfortunate minister (XI, XII). Chillingworth's discovery activates his malice (p. 139) transforming him into a demon, while Dimmesdale is impelled toward madness as his undiscovered enemy subtly works on his conscience. Ironically, as the pivotal "The Minister's Vigil" (XII) dramatizes, Dimmesdale alone is unable to perceive his physician's demonic transformation. Having departed "out of life as completely as if he indeed lay at the bottom of the ocean, whither rumor had long ago consigned him" (p. 119), Chillingworth attaches all of his interests to the minister with a single-mindedness which limits him to the realms of sin and death.

In his investigations Chillingworth is presented by the narrator as a metaphorical grave robber, digging "into the poor clergyman's heart, . . . like a sexton delving into a grave, possibly in quest of a jewel that had been buried on the dead man's bosom, but likely to find nothing save mortality and corruption. Alas for his own soul, if these were what he sought!" (p. 129). He does in fact ignore all of the finer things he discovers in Dimmesdale's character while he seeks out guilt (p. 130); in St. Paul's terms, he is "a natural man" who "receiveth not the things of the spirit of God; for they are foolishness unto him" (I Cor. 2:14). But limited to mortality as he is, Chillingworth is interpreted by all but Dimmesdale in spiritual, though demonic, terms. And he does play a role which is appropriately so interpreted, but with a number of ironies and qualifications included in its explication.

Two points may be advanced concerning Chillingworth's role as fiend or demon; first, though it may be true that Hawthorne at points gothicised him into unbelievability through unfortunate dramatic emphasis, he is not the only character to act the part of the Black Man.[19] Hester ascribes that identity to

Dimmesdale when at Pearl's insistence she explains that she has met the Black Man in the forest and the letter is his mark (p. 185). This explanation comes shortly before she again meets the minister in the forest, and the child, not knowing whom they are to encounter, expects the devil (p. 187).[20] And after the forest meeting in which Hester helps Dimmesdale to resolve to flee the colony and take on a new identity, he feels that he has met Satan in the person of Hester (p. 222).[21] Though Chillingworth's identification as a demon may be more consistent than that of the other characters, it is not less subject to multiple interpretation and dramatic irony.

Second, Chillingworth does not share the Puritan system of belief; in fact, he regards Dimmesdale's view that in his anguish he is being tortured by a fiend as "the superstition common to his brotherhood" (p. 171). Through Dimmesdale's orthodoxy the physician is able to manipulate the minister in a way which exercises in Puritan terms "a devil's office" (p. 170); but only when Hester confronts her former husband with what he has become does he see himself, though fleetingly, as demonic (p. 172).

In an important scene, "Hester and the Physician" (XIV), Hester attempts to employ her influence for good to dissuade her former husband from further exercising the "quiet depth of malice, hitherto latent" (p. 139) which he has activated in the discovery of Dimmesdale's secret. Here she negates the promise she made during "The Interview" (IV) and attempts to steer the old physician from the course she foresaw for him when she first designated his purposes as those of the Black Man. Even in spite of that "glare of red light" (p. 169) which the narrator describes as emitted by Chillingworth's eyes, Hester does not see his demonic transformation as forever fixed. She employs a species of what Lavater calls *pathonomy:* "the knowledge of character" through "the signs of the passions." This is "character in motion," what a man "becomes at particular moments; or what he might be."[22] Knowing what Chillingworth has been, Hester attempts to restore his better nature.[23]

Hester's attempt is revelatory to Chillingworth. It is in describing his work on the minister that the physician sees what has become of his former self, benevolent and studious as both he and Hester recognize him to have been. He asks Hester, "What see you in my face . . . that you look at it so earnestly?" (p. 170). Through Hester's response that "hatred . . . has transformed a wise and just man to a fiend" (p. 173), he understands that he has in fact fulfilled a role drawn from the world-view of the "superstitious" minister. He reacts "with a look of horror, as if he had beheld some frightful shape, which he could not recognize, usurping the place of his own image in a glass" (p. 172). However, in scriptural terms, he is "like unto a man beholding his natural face in a glass: For he beholdeth himself, and goeth his way, and straightway forgetteth what manner of man he was" (Jas I: 23–24).

Since Hester's influence as a woman is brought to bear in an attempt to save Chillingworth from damnation, echoes of Goethe's *Faust* may come to mind; however, she operates in a dramtic situation which also recalls Marlowe's version of the Faust myth, in which the Old Man approaches Faustus even at the threshold of his damnation with:

> Though thou has now offended like a man,
> Do not yet perserver in it like a devil.
> Yet, yet, thou hast an amiable soul,
> If sin by custom grow not into nature.[24]

In both cases the appeal fails. But here Hester's response is as significant as Chillingworth's. She, too, can be changed by active passion, and her failure to win mercy from the physician breeds hatred of him. She mentally ascribes to him a whole catalogue of infernal attributes, expecting him to "spread bat's wings and flee away, looking

so much the uglier, the higher he rose toward heaven" (p. 176).

Chillingworth's transformation into a fiend, most directly evident in this scene, is presaged, as has been noted, by Hester in the prison interview, and again when she sees an ugly physical change in him at the Governor's mansion (p. 112). The people of Boston also discern his "remarkable change": "At first, his expression had been calm, meditative, scholar-like. Now, there was something ugly and evil in his face, which they had not previously noticed, and which grew still the more obvious to sight, the oftener they looked upon him" (p. 127). So sinister does Chillingworth seem that they see him as an evil spirit contesting with their minister in a battle from which they expect Dimmesdale to emerge "transfigured" (p. 128). Such a transfiguration does take place in the public imagination, which converts the hypocritical clergyman to an angel; but the conflict they discern has other ironic dimensions which the people cannot fully understand.

Paradoxically, Chillingworth does act the part the community assigns him, but he does so by moving Dimmesdale toward self-realization as Goethe's Mephistopheles does Faust, quite against his own aims.[25] His unwilling participation in the minister's "salvation" has further resonances than those which apply to the community's perceptions, however. For in taking up his home with Dimmesdale, ostensibly to act as his physician, Chillingworth establishes a laboratory which the town sees as a passage to hell: "According to the vulgar idea, the fire in his laboratory had been brought from the lower regions, and was fed with infernal fuel; and so, as might be expected, his visage was getting sooty with smoke" (p. 127). But the science of alchemy, which Chillingworth admits practicing and uses as an analogy for his quest for the truth about Pearl's father (p. 75), is traditionally a path of spiritual perfection, not of damnation.[26]

According to one writer whom Hawthorne may have encountered about the time he was working on *The Scarlet Letter,* "the principal object of the alchemist was a perfection of that knowledge by which the secrets of nature could be laid open; and, so far, was not only lawful, but a laudable pursuit; particularly when associated with the prevailing and frequently repeated, opinion, that the initiated were working under the immediate sanction and guidance of the Almighty."[27] For the alchemist as for the physiognomist, to "make things that are not perceived, but lie hid in shadow, to appear, and to take from them their veil, is granted to an intelligent philosopher through nature."[28] Chillingworth does not desire either the spiritual perfecting of Dimmesdale or the public exposure to which that would necessarily lead. But he does propel the minister toward a rebirth which fits patterns of both alchemical and Christian symbolism.

For the practitioner of alchemy, "death was more a term implying transformation than destruction." "The perfection of every thing . . . requires a new birth, as that which is sowed is not quickened except it die; but here death is taken for mutation, and not for rotting under the clods."[29] Echoing as it does I Corinthians: 15, this passage is important in its elucidation of the multiple possibilities of *The Scarlet Letter's* symbolism of death and rebirth. That alchemical symbolism is indeed one of the possible methods of viewing the romance's spiritual dimensions is made clear by the narrator in his "Conclusion" (XXIV), in which he seeks to draw morals and settle destinies.

Though Chillingworth would finally seem to have unhumanized himself to the point of necessarily being packed off to hell, the narrator employs an alchemical analogy in an attempt to "be merciful" to his "shadowy beings," including Chillingworth (p. 260). He writes of love and hate: "Philosophically considered . . . the two passions seem essentially the same, except that one happens to be seen in a celestial radiance, and the other in a dusky and lurid glow. In

the spiritual world, the old physician and the minister—mutual victims as they have been —may, unawares, have found their earthly stock of hatred and antipathy transmuted into golden love" (pp. 260–261). But this is a qualified attempt to provide a balance of forces in tragic resolution, not a theological assertion, and morally it does not condone Chillingworth's conduct.

Within the dramatic action of the romance Chillingworth may himself use alchemical typology in his own defense. When he perceives himself as a fiend but rejects Hester's suggestion that he can change (XIV), the old man says, "My old faith, long forgotten, comes back to me, and explains all that we do, and all we suffer . . . Ye that have wronged me are not sinful, save in a kind of typical illusion; neither am I fiend-like, who have snatched a friend's office from his hands. It is our fate. Let the black flower blossom as it may!" (p. 174). In alchemy the "black flower" is that stage in the process which is a harbinger of gold. Chillingworth may thus be recalling the high-minded alchemical faith which animated his more benevolent past pursuits.

In the human dimension Chillingworth does what can aptly be called devil's work. But in claiming a typical part in a fated process he throws off his identification with the demonic as it is seen by the Puritan mind; and in the spiritual realm he may be correct—just as Dimmesdale may be correct in his judgment, which seems confirmed by the power of his sermons, that a sinful man can do good in a ministerial office (p. 132). The tone and method of *The Scarlet Letter* are premised upon such ironies. But death shrouds from individuals the ultimate designs of Providence, and the roles of prophet and magician stand in ironic counterpoint to those who would play them. Death is the boundary of a drama in which characters summoned from the grave return to it. Though the narrator makes a spiritual disposition of his "shadowy people," the book's final revelations are of the passions which Hawthorne portrayed employing appropriate symbolic frames of reference beyond Puritanism.

Notes

[1] The words of the Earth Spirit in Goethe's *Faust,* Part I, lines 508–9, trans. Walter Arndt (New York: W. W. Norton, 1976), p. 14.

[2] The transforming initiation has religious significance, "for the change of existential status in the novice is produced by a relgious experience. The intiate becomes another man because he has had a crucial revelation of the world and life." Mircea Eliade, *Rites and Symbols of Intiation: The Mysteries of Birth and Rebirth* (New York: Harper and Row, 1958), p. 1.

[3] A study of literary transformation is Irving Massey, *The Gaping Pig: Literature and Metamorphosis* (Berkeley: University of California Press, 1976).

[4] Nathaniel Hawthorne, *The Scarlet Letter,* ed. William Charvat, Vol. I. *The Centenary Edition of the Works of Nathaniel Hawthorne* (Columbus: Ohio State University Press, 1962), p. 23. All subsequent references to this volume will appear in the text.

[5] The Custom-House, like "Circe's Palace" in *Tanglewood Tales* (Centenary Edition, Vol. VII), turns men like the old Inspector into animals. Only the artist's vision spares the "Custom-House" narrator this fate. The range of sensibilities suggested by him resembles the Renaissance Neo-Platonic scale upon which man has kinship with both the beasts and the angels, as expounded by Pico della Mirandola in *On The Dignity of Man,* for example.

[6] The importance of "The Custom-House" in establishing significant patterns for the romance as a whole has been noted in numerous studies. A few which stress the role of the narrator's imagination are Nina Baym, "The Romantic Malgre Lui: Hawthorne in 'The Custom-House,'" *ESQ: A Journal of the American Renaissance,* 19 (1973), 14–25, reprinted in *The Shape of Hawthorne's Career* (Ithica, N.Y.: Cornell University Press, 1976); John Paul Eakin, "Hawthorne's Imagination and the Structure of 'The Custom-House,'" *American Literature,* 43 (1971), 346–358; Harry C. West, "Hawthorne's Editorial Pose," *American Literature,* 44 (1972), 208–221.

[7] Millicent Bell, in Hawthorne's *View of the Artist* (New York: University Publishers, 1962), asserts that Hawthorne's "most deeply felt image of the artist" is that of a necromancer, "a worker of illicit black magic," p. 58, and as Harry C. West notes in "Hawthorne's Magic Circle: The Artist as Magician," *Criticism,* XXX, 16 (1974), 311–25, magic circles pervade his art. The magician works at the border of two worlds calling up characters like ghosts, but the ghostly border also suggests access to the next world's revelations. The fashion in which revelation comes in Hawthorne is close

to that discussed in a passage from Creuser in Joseph Ennemoser's *The History of Magic,* trans. Howett (London, 1854): "The strictly symbolical confines itself to the . . . middle line between Spirit and Nature; within these bounds it can avail to render visible to a certain degree even the Divine, and is so highly expressive. It obeys Nature, merges itself into her form, and animates it; the infinite becomes human, and thus the strife between the two is at an end" (II, 6). Creuser's discussion of symbols comes from his work on myth. Ennemoser's quotation of Creuser reflects a sense of the connections between myth and magic close to Hawthorne's. Hawthorne employs his "magic" art at a boundary in which he shapes myths which contain elements of relevation. Whether Hawthorne knew of Ennemoser's work, originally published in 1846, is not known. But he was influenced by Creuser at least to the extent of his admitted employment of Charles Anthon's *A Classical Dictionary* (New York: Harper, 1844), which in its preface (vii) acknowledges the primacy of Creuser's system of mythology, and extensively employes *Symbolik und Mythologie der alten Volker, besonders der Griechen* (Heidelberg, 1810), widely known through its heavily annotated French edition by J. D. Guigniaut, *Religions de L' Antiquite* (Paris, 1825). Hugo Mcpherson has done a reading of Hawthorne based on Anthon: *Hawthorne as Myth-Maker* (Toronto: University of Toronto Press, 1969).

[8] Hawthorne's work presents competing modes of vision, none of which is given supernatural validation. He solves problems psychologically rather than doctrinally. For studies of multiple interpretation in Hawthorne's narrative, see Elaine T. Hansen, "Ambiguity and the Narrator in *The Scarlet Letter,*" *Journal of Narrative Technique,* 5 (1975), 147–63, and John O. Rees, Jr., "Hawthorne's Concept of Allegory," *Philological Quarterly,* 54 (1975), 494–510.

[9] The best studies of dramatic irony and transformations respectively, remain Richard Harter Fogle, *Hawthorne's Fiction: The Light and the Dark,* rev. ed. (Norman: University of Oklahoma Press, 1964), and Roy R. Male, *Hawthorne's Tragic Vision* (Austin: University of Texas Press, 1957).

[10] *Lebenswelt* as here employed implies the sense which Merleau-Ponty gives it when he writes of his philosophy's effort to "return to the life-world this side of the objective world; . . . to give the thing its concrete physiognomy, to organisms their own manner of handling the world, to subjectivity its historical inherence" —*Phenomenology of Perception* as quoted in "Translator's Preface" to *Signs,* trans. Richard McCleary (Evanston: Northwestern University Press, 1964), p. xiii. Hawthorne's view of history restores to it a full range of belief systems, including the occult.

[11] The sense of division in tragedy is given emphasis by Robert B. Heilman's "Tragedy and Melodrama," *The Texas Quarterly,* 3 (Summer 1960), 36–50, reprinted in *Tragedy: Vision and Form,* ed. Robert W. Corrigan (San Francisco: Chandler, 1965), pp. 245–257. *The Scarlet Letter* reflects "the kind of division that seems inseparable from human community—from the fact that, in the ordering of life, we maintain different imperatives that correspond to different and perhaps irreconcilable needs" (p. 246). On tragedy, see Richard B. Sewall, *"The Scarlet Letter," The Vision of Tragedy* (New Haven: Yale University Press, 1961), 86–91; Bruce I. Granger, "Arthur Dimmesdale as Tragic Hero," *Nineteenth-Century Fiction,* 19 (1964), 197–203; Dan Vogel, "Hawthorne's Concept of Tragedy in *The Scarlet Letter,*" *Nathaniel Hawthorne Journal* (1972), 183–93. Richard R. Brodhead, in *Hawthorne, Melville, and the Novel* (Chicago: University of Chicago Press, 1976), sees Hawthorne employing formal division through his use of the narrator's objective stance, which contrasts the fixed meanings of the Puritan community with the open-ended symbolism arising from life situations (pp. 64–65).

[12] This is a version of the principle of organization perceived by John C. Gerber, "Form and Content in *The Scarlet Letter,*" *New England Quarterly,* 17 (1944), 22–55.

[13] Transfiguration usually implies an encounter with divinity. The Transfiguration of Jesus (Mt 17:1–8; Mk 9:1–7; Lk 9:28–36) is the central instance.

[14] Sermons gain in ironic significance throughout the romance. Hester is the living version of the message underlying all of Dimmesdale's sermons, which take power from his anguish. For an historical perspective on the ecclesiastical elements of the romance, see Frederick Newberry, "Tradition and Disinheritance in *The Scarlet Letter,*" *ESQ: A Journal of the American Renaissance,* 23 (1977), 1–26.

[15] Hester has often been seen, in Darrell Abel's words, as typifying "romantic individualism," in opposition to the community, "Hawthorne's Hester," *College English,* 13 (1952), 303. A good examination of how themes of isolation inform Hawthorne's major romances is Arne I. Axelsson, "Isolation and Interdependence as Structure in Hawthorne's Four Major Romances," *Studia Neophilologica,* 45 (1973), 392–402. See also Nina Baym's "Passion and Authority in *The Scarlet Letter,*" *New England Quarterly,* 43 (1970), 209–30, also reprinted in *The Shape of Hawthorne's Career.*

[16] According to Marion L. Kesselring, "Hawthorne's Reading," *Bulletin of the New York Public Library,* 53 (1949), 185, Hawthorne read Lavater's *Essays on Physiognomy* in October 1828. On the resemblance of children to parents, see *Essays* (Boston: Spotswood and West, n.d.), p. 117. Taylor Stoehr's "Physiognomy and Phrenology in Hawthorne," *Huntington Library Quarterly,* 37 (1974), 355–400, reprinted in his *Hawthorne's Mad Scientists* (Hamden, Connecticut: Shoe String Press, 1978), is a rich source of physiognomy in Haw-

thorne; however, it makes none of the points advanced in this study.

[17] Lavater also notes the influence of the mother's imagination on the child. "We also know," he writes, "that children most resemble the father only when the mother has a very lively imagination, and love for, or fear of the husband" (*Essays,* p. 115). Hawthorne makes clear the influence of Hester's imagination on Pearl throughout the romance.

[18] Lavater, p. 10.

[19] Chillingworth's demonic nature has long been the subject of discussion. The classic study is William Bysshe Stein's, in *Hawthorne's Faust* (Gainesville: University of Florida Press, 1953) pp. 104–22. See also Darrell Abel, "The Devil in Boston," *Philological Quarterly,* 31 (1953), 366–81, and Edward Stone's "Chillingworth and His Dark Necessity," *College Literature,* 4 :1977), 136–43, which answers points advanced by Martin Green's *Re-Appraisals* (New York: W. W. Norton, 1965).

[20] Witchcraft in general is well handled in Karl Wentersdorf's "The Elements of Witchcraft in *The Scarlet Letter,*" *Folklore,* 83 (1972), 132–53.

[21] For Hester's role within a Faustian framework, see Neal B. Houston, "Hester Prynne as Eternal Feminine," *Discourse,* 9 (1966), 230–44.

[22] Lavater, *Essays,* pp. 24–25.

[23] Lavater discusses the restoration of harmony in the character of a loved one through "cooperating with the yet unimpaired essential powers" *(Essays,* p. 37).

[24] Christopher Marlowe, *Doctor Faustus,* V, i, 40–43.

[25] Dimmesdale's confession ends his personal division through hypocrisy; whether or not he is "saved" is a point which has been disputed. If one employs a physiognomic interpretation of Dimmesdale's transfiguration during his final hours, no implications of salvation need be drawn. Employing a long tradition that persons are restored to nobility near death, Lavater writes, "I have observed some among the dying, who had been the reverse of noble or great during life, and who, some hours before their death, or perhaps some moments . . . , have had an inexpressible ennobling of the countenance. Every body saw a new man; coloring, drawing, and grace, all was new, all bright as the morning; beyond expression, noble and exalted." (*Essays,* p. 124). Among critics who focus on Dimmesdale's last moments are Terrence Martin, "Dimmesdale's Ultimate Sermon," *Arizona Quarterly,* 27 (1971), 230–40, and William B. Dillingham, "Arthur Dimmesdale's Confession," *Studies in Literary Imagination,* 2 (1969), 21–26.

[26] Critics have worked on alchemical patterns in a number of Hawthorne's works; for example, David M. Van Leer's "Aylmer's Library: Transcendental Alchemy in Hawthorne's 'The Birthmark,'" *ESQ: A Journal of the American Renaissance,* 22 (1976), 211–20; Mark Henelly, "Hawthorne's Opus Alchymicum: 'Ethan Brand,'" *ESQ: A Journal of the American Renaissance,* 22 (1976), 96–106.

[27] Hawthorne may have read "Alchymy" in the *Retrospective Review,* 14 (1826), 98–135, which according to Kesselring he checked out on November 12, 1849 ("Hawthorne's Reading," p. 189). The quotation cited appears on p. 107.

[28] "Alchymy," p. 127. Alchemy employed a theory of natural "sympathies" through which its adepts worked. As Walter Pagel explains, "Alchemy and Medicine . . . form two aspects of natural magic already in Hellenistic times. The Magus applies the principle of sympathy; everywhere like years to unite with like . . . The 'seat of magic' . . . lies in Nature in which as by a magic chain everything is interconnected and alive. It is the task of the Magus to adapt himself to Nature so closely that he can influence it by setting, as it were, a sympathetic chord into vibration." "Paracelsus and the Neo-Platonic and Gnostic Tradition," *Ambix: The Journal of the Society for the Study of Alchemy and Early Chemistry,* 8 (1960), 125–66. The importance of the concept of sympathy in general is treated by Roy R. Male, "Hawthorne and the Concept of Sympathy," *PMLA,* 68 (1953), 138–49.

[29] "Alchymy," p. 109.

NOAH IN INTERNATIONAL WATERS

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Tales of a huge flood sent by the gods appear in cultures throughout the world. North American Indians and Siberian peasants each have a legend about how a small group of animals and people were saved from a watery death. However, the two most famous accounts come from the Middle East. The *Epic of Gilgamesh* from Babylon tells how the King and his family were spared from the wrath of the storm god by heeding the instructions of the god of water to build a giant boat. More familiar to people in Western cultures is the Genesis account of Noah and the great flood.

Noah's story is the Old Testament tale most often retold in picture books. In fact, dozens of versions have been produced by authors and illustrators in the United States. But the fascination with Noah's story continues in other parts of the world as well, as a number of picture books demonstrate. Indeed, the continuing interest indicates that Noah indeed sails in international waters.

Probably the most familiar Noah's ark picture book, at least to audiences in the United States, is the one by Peter Spier, which won the Caldecott award in 1978. But even those who have examined Spier's book may have forgotten that he chose as its "text" a 17th century poem by Jacobus Revius, which he translated from Dutch to English. Using this poem from his native country, Spier amplifies both its simple text and the Biblical version through his marvelously detailed and evocative illustrations. The poem's long list of boarding animals, including

Cow and moose,
Hare and goose,
Sheep and ox,
Bee and fox

is reflected in pictures of the loading of the ark which teem with all kinds and sizes of animals. But neither the poem nor Spier ignores the reality of those who could not get on.

But the rest,
Worst and best,
Stayed on shore,
Were no more.
The whole host
Gave the ghost.
They were killed
For the guilt
Which brought all
To the Fall.

The illustrations show a throng of animals, young and old, watching the ark as the flood water rises. Inexorably they are covered, even those which climbed into trees to escape.

Spier's imagination takes over in his pictures of life on board since neither the Bible nor Revius' poem supplies details of the trip. But the reader senses the "rightness" of the portrayal because it is consistent with our knowledge of animal life. The animals must be fed and their stalls cleaned. They give birth, some, like the rabbits, with remarkable regularity. And they rejoice when the dove returns with green leaves. Spier enriches the reader's understanding of Noah's story, and the book well deserves its Caldecott medal.

As might be expected, the book that adheres most closely to the Old Testament comes from Israel. Yael Guiladi stresses God's anger about what people had done to his world, an emphasis apparent in most books that give God a prominent role. In Guiladi's version, God had given people a "general idea of how He expected them to

behave," but they became wicked, dishonest, cruel, and corrupt. When God plans to destory the world, he tells Noah to take a pair of most animals but seven pairs of clean animals. This injunction, which is found in Genesis, is ignored in most retellings of Noah's story but would have significance for Jewish readers because of their religious practices. Other parts of Guiladi's story, such as the exact specifications of the ark's dimensions, reveal a faithfulness to Old Testament details not observed in most versions. The illustrations portray Noah and his family as inhabitants of the Middle East. All have slightly slanted eyes and dark hair and complexions. The women have large earrings and cover their heads with a garment that extends to their feet.

The illustrations for Swiss poet Max Bolliger's retelling also have an Eastern feeling. Helga Aichinger has used spare figures and muted colors to accompany Bolliger's text, which is close to Genesis. Again God is a dominant force, displeased with people because they disobeyed and then laughed at Noah for his obedience. "Their scorn did not trouble Noah. But God was angry with them because they did not fear Him, and because they laughed." These scoffers die a horrible death, as Bolliger emphasizes when he describes their flight to the hills and mountains in a futile attempt to escape. Dead bodies float in green and purple water in Aichinger's gruesome depiction of their fate. Bolliger's account of the trip's length and the various flights of raven and dove follows strictly the Genesis version. When the water recedes, all that people had built and planted has been destroyed. Certainly this is a grim tale, particularly for a picture book. But then Bolliger offers his readers hope, the same hope Noah feels looking at God's rainbow sign.

> God heard Noah's prayer of thanks
> He looked at the ruined earth
> and had pity
> on Noah, whom He loved,
> and on his family—
> his wife,
> his three sons,
> their wives,
> and children,
> and all the children of these children,
> who were not yet born.

This stress on life's continuity is clear in the picture of a small boy and girl playing with a miniature ark in a puddle. Noah and his family were spared so that life could go on.

Two more recent stories, also originally written in German, display similarities to Bolliger's retelling. Gertrud Fussenegger shares Bolliger's emphasis on the wickedness of humankind and its horrible destruction. In her story Noah prays every night that God would keep him safe from people who "lied and cheated and hurt one another . . . beat defenceless [sic] people with whips and sticks." These wicked men and women mock Noah and his family until the rain starts to fall. Then they pack their gold and head for the mountains. Inside the ark Noah hears their "pitiful wailing" as even "the last and strongest of the people, who had clung to the treetops or climbed mountain peaks, were washed away and drowned." Life on board the ark has its own discomforts, but at the journey's end, Noah and his family praise God for their deliverance and receive his rainbow and promise not to destroy the world again with a flood.

Margrit Haubensak—Tellenbach also includes the destruction of the doubters, who "cried and screamed and banged on the ark" as the waters cover them. But her account shares another theme with Bolliger's as well: the continuation of life. Animals give birth while they journey on the ark, and as they depart, Noah instructs them to "'Go and have lots of children.'" Two double-page spreads, one on shipboard and one on land, emphasize the theme. The pages are jammed with animals and their young in illustrations by Erna Emhardt, one of Germany's foremost "primitive painters."

The concern with reproduction is strongest in an Italian version by Jolanda Colombini

Monti, who emphasizes what happens *after* the flood. Once God has explained about the rainbow, the animals start to leave the ark. God instructs them to "wander over the Earth, grow and multiply." Many of them do not need those instructions. Baby mice and rabbits leave the ship with their parents. The text mentions that "even the ostrich alighting from the Ark showed Noah a little baby ostrich just a few days old who was still a little unsteady on his huge legs." The fertility of the animals is even more apparent in the fold-out illustration in which almost every species has been eager to follow God's command to "raise a family and multiply the species." This emphasis does not seem unusual for a country that is heavily Roman Catholic, particularly when we note that it was written in the mid-1950s. Another part of the story that seems to indicate the religious influence is the ending in which Noah becomes a farmer who is the first to discover the importance of bread and wine. Although Genesis acknowledges that Noah planted a vineyard, and Spier shows him on his hands and knees setting out vines, Monti is the only author to give such prominence to this part of the tale, linking it to the Roman Catholic sacraments.

Another strongly religious retelling comes in a Liberian version of Noah's story. While Lorenz Graham was in Africa, he heard the native people telling stories from the Bible, "recreating the tales in their own environment and telling them in their own words." In their version, God plays a crucial role. They begin by tying Noah's story to the creation.

> God make the time for Him Own Self.
> He make the rain
> He make the dry and wet.

Disappointed and angered by what people are doing to His creation, God decides that He must try again. He visits Noah and instructs him about preparations for the flood, then becomes an active participant in the boat's construction.

> God come walk about inside the ship
> And Noah hear God's Word and mind.

He advises Noah about bad boards that need replacement, locations of rooms, and other details. In keeping with the African origin of this version, the illustrations depict Noah and his sons as blacks and the boat as a kind of basket that might have been constructed of materials found in a tropical region. Noah and his sons fell palm trees to get building materials. When all the animals are on board in accordance with God's instructions, He makes the rain fall. After He is certain that everything has been destroyed except for Noah's ship, He opens new holes in the sea to drain away the water, sends dry winds to sweep the world, and sets the ship down softly. There are no raven and dove in this version. God is the one who provides for Noah and his company, and the flood has been for His benefit, giving a way to start again, as the book's ending makes clear:

> And in the sky He set Him bow
> And turn to make a better world.

The African story ignores the raven and dove but stays close to Genesis in plot and moral. A Japanese picture book gives the two birds a prominent place, and in so doing demonstrates how modern authors often move away from the Biblical tale. In 1964 *Pooke and Kark in the Ark* by Sekuja Miyoshi was voted the outstanding picture book in Japan. Although Miyoshi includes other animals in his story, he concentrates on two birds: Kark the crow and Pooke the dove. After God tells Noah that a drought will be followed by heavy rains, Noah constructs an ark and begins collecting animals. His neighbors laugh at the strange vehicle which looks like a large wooden box due to Noah's inadequate building skills. Kark refuses to board because his forest home is on a hilltop, and he is convinced no flood can reach it. Pooke urges him to follow Noah, and eventually the crow is forced to join the other animals on the boat. After the rain ends and the boat drifts for 150 days,

the animals get restless. Kark decides to find land, and when he does not return, the animals begin to worry. Pooke volunteers to search for him, and eventually she finds dry land and Kark. Unlike the crow, she feels obligated to return to her shipmates. On the return trip she gets tired and cannot find the ark. Then she sees the rainbow, which gives her new energy. "She flapped her wings with all her strength, and passed under the rainbow toward the ark."

Miyoshi has kept many of the Biblical elements but given prominence to two birds which figure in that tale. They act independently of Noah and have definite personalities. The illustrations are brilliantly colored and exhibit a fine graphic sense. Bright orange, purple, brown, blue, green, and other hues are arranged in patterns that make the reader aware that this book is a product of the "modern" period which revises an ancient story. Yet Miyoshi's contrast of the believer versus the doubter echoes a theme of the original account. Here the contrast is between two birds instead of between Noah and his neighbors.

Like Miyoshi, Isaac Bashevis Singer uses the dove as a central character in his tale about the ark. Just as Spier returned to the language of his youth to find a text for his work, Singer used his childhood language, Yiddish, and let Elizabeth Shub translate the work into English. While Noah and his sons construct the boat at God's command, the animals argue because they "had heard a rumor that Noah was to take with him on the ark only the best of all the living creatures." Each stresses his own virtue such as strength, beauty, or cleverness. Almost the entire book is devoted to their bickering. Finally Noah appears and sees a dove silently perched on a branch. It explains why it didn't brag by saying, "'Each one of us has something the other doesn't have, given us by God who created us all.'"Then Noah tells all the animals that they can come on board, but because the dove had been modest, Noah chooses it to be his messenger. The flood itself doesn't appear. The text simply skips to the time when the rains stop, and Noah keeps his word by sending the dove. The story ends with the moral that "there are in the world more doves than there are tigers, leopards, wolves, vultures, and other ferocious beasts. The dove lives happily without fighting." Although Singer mentions God's promise not to destroy the earth again because of sin, the focus of Singer's tale is on the dove and the example it provides. His tale is designed to teach a moral that is not explicitly stated in the Old Testament but which he obviously feels is important for contemporary readers.

Similarly, British author Brian Wildsmith adapts Noah's story to address a modern problem, man's destruction of the natural world through pollution. While Wildsmith looks back to the ancient story for his central idea of the survival of animals from extinction, he sets his own tale in the future for a type of "science fiction" story of Noah. The animals who live in the forest are threatened by air pollution and meet to decide how to escape. Owl reports that he has seen a "huge and wondrous object" being built, and when the animals investigate, they find Professor Noah, who is constructing a spaceship to take the animals to another planet where the forests "'will be as beautiful as our forest once was before it was spoiled by pollution.'" The animals help Noah's robots finish the task and prepare for the voyage of 40 days and 40 nights. They clamber on board to escape a terrible forest fire set by man and blast into space. In the take-off a time guidance fin is damaged, and an elephant must don a spacesuit to adjust it for their voyage into the future. However, he miscalculates, and the ship is propelled backward. After they land, Noah realizes that the leaf the dove brings from her exploratory mission is from Earth—but what a difference! They have landed on Earth "as it was many hundreds of years

ago, before it was polluted." As the animals emerge from the ship, the otter comments that there seems to have been some flooding.

While the problem and solution Wildsmith uses are "modern," his retention of certain conventions clearly reveals his awareness of the original: 40 days and 40 nights, the dove as explorer, the watery world. As in Miyoshi's and Singer's books, the animals here are active participants in the advancement of the plot. In fact, Noah is the only human and does not even take his own family on the voyage. Like all Wildsmith's picture books, this one is brightly colored. The many animals in the story give him a chance to exhibit his considerable talent in drawing wildlife.

The animals tell their own story in another English picture book about Noah by George Macbeth. In fact, inanimate objects get to speak too. Macbeth offers a series of short poems, each about a different plant, animal, or object encountered in Noah's story. After the descriptive poem *about* the story element, the subject makes its own comment on the situation. Oak and pine speak during the "Building of the Ark." Then 11 animals have their say while they enter. For example, Noah has this conversation with a roly-poly bear.

are you there? Why you smell
of honey. You voracious small bear!
Why have you come with your paws all
sticky? Go down to the sink.
You must dance for your
supper, and it won't be sweets.
Coarse brown bread for omnivorous
bears. And a beaker of brine
if we have to keep washing you in drinking water.

I am sorry, Noah. But I grew
quite faint. So I stopped by a hive
for a rest and a meal.
Let me give you a hug.

During the storm a "Battle with the Elements" pits Noah against thunder, lightning, rain, and wind as all the creatures on board suffer.

rain
is the one who goes on. He is flung
pita-pata-pita-pata from a
tipped bowl of dry peas. Wet fur,
wet wood, wet wings, wet canvas: the
whole wide world is awash in a
sluice of beans. Rattle, rush.
Down comes the roof in a slush
of cold glass bits. Below decks
glum beasts peer out and steam dry slowly.

Finally, sand, rock, and grass welcome the voyagers when they come safely to their "Landing of Ararat." The dove and the raven feed peacefully in the thick grass filled with flowers, worms, bees, ants, butterflies, and a spider. Two pages of poetry are followed by two pages which illustrate the subjects of the verse. The ark is invariably portrayed as a small vessel, whether dwarfed by the whale that swims beside it or buffeted by wind.

Macbeth's use of short poems based on Noah's adventure is reminiscent of a much earlier English version by Fish, published in 1918. Each short poem is on a different topic, and the author claims that he was told about the trip by a teddy bear named Redder.

He knew the Noahs very well
And went with them to sea,
And all that I am going to tell
Young Redder told to me.

All the animals look as though they had stuffed toys as models, and even the people look like wooden dolls. The journey is idyllic, with time for the animals to swim in their striped suits and enjoy the outing immensely, rather as though the ark were a well-appointed yacht.

This portrayal of the ark as a kind of cruise ship appears in a modern British version of Noah's story by Judy Brook. After Noah learns about the impending flood from a well-informed dove, he hurriedly constructs a giant ship, complete with striped sails and a royal lion masthead. Noah and his family are sturdy English peasants,

used to handling farm animals. The women have a cozy farm kitchen on board and geraniums in the windows. Rather than bringing the animals to the ark, the Noah family sails around the world to rescue a pair of each kind. They take polar bears and walrus on board before the ice floes melt and ferry zebras and lions from mountain tops. Each day the animals run around the deck for exercise and hear Mrs. Noah's bedtime stories. When land is sighted, everyone gratefully takes "a lovely hot sunny holiday" on the African coast, where the Noah family members lounge in beach chairs. Then the ark completes another round-the-world voyage to return the animals, who "always felt so sad when the Ark left them, they were almost sorry the flood was over." Clearly, Brook's story lacks any sense of punishment or destruction inherent in the original.

The same barnyard adventure format is obvious in *Norah's Ark,* also from Britain. Norah and her animals learn of the impending flood from a TV weatherman. They turn the barn upside down to form a makeshift boat and have a "holiday afloat." Despite a few minor complications, no one is hurt, and when the water subsides, the animals and their owner are left with an enlarged pond, something they had wanted for a long time. Like the rest of the British books, this lacks any theological dimension. Instead the flood is simply a diversion from everyday activities.

A similar attitude is evident in two French versions. The first, by Matias (Charles Henriod), has Noah invite all the animals to board his multi-storied yacht, which resembles a tiered apartment building. On top is a little house for Noah's family. The animals tell each other stories, and at night they "were very good and slept without making a sound." When the sun shines after 40 days, the elephants tip the ark to one side with their jumps of delight. The animals rush to disembark on Ararat and return to their countries when the water has receded. Because no reason for the flood is given and no word of hope offered at the end, despite the rainbow that appears in the sky, the story seems flat and strangely without purpose. Noah in his red beret and his wife in her long blue apron are undeniably French, but the illustrations are almost as unsatisfactory as the text with blobs of bright colors scattered randomly over figures drawn with black ink.

The other French version, by Etienne Delessert, reveals its kinship to some of the English versions in its title, *Sans Fin La Fete.* The party is to celebrate the launching of Captain Noah's boat, and the crows deliver the party invitations. All kinds of animals converge on the ark for a sea cruise. They eat cake and ice cream and watch the snake do acrobatics. The party is fine until they decide to hold a jumping contest. The flea jumps so high that it hits the sun in the eye, and the uncontrolled tears lead to a serious flood. The animals retreat inside but continue the party with story telling. As the days pass, they play games, take turns steering, and hold concerts, but eventually they become restless and irritable. They play practical jokes and plan a mutiny. While Noah listens to the centipede tell story after story, the seal changes course. The dove, a peaceful creature, dislikes the mutiny and flies in search of land. Soon she returns with a branch and a *postcard* showing a mountain she discovered. The animals once again have reason to celebrate.

Probably the strangest detail in the illustration of this version is the "human" sun which has facial features plus suit-coated arms and hands. His two-fingered V salute after the rain ends resembles the gesture of a politician, particularly since he also displays a toothy grin. Even this bizarre account reveals its derivation from the original Noah story although the elements are definitely transformed. For example, the rainbow appears at the end in the guise of a chameleon that "turned every color of the rainbow." The Biblical interpretation of its presence as a sign of divine promise has been replaced by

a natural phenomenon. As in many of the books already discussed, God simply has no role.

Although these secular versions may be designed to satisfy modern audiences who no longer believe in traditional religion, the stories are unsatisfying. By removing God and religious overtones, the authors have removed much of the conflict and drama as well. Good and evil, struggle against the elements, rebirth and hope for the future are all part of the original story. The idea that representatives of all earth's animals could be crammed on a single vessel and somehow survive an overwhelming catastrophe is incongruous, unbelievable . . . and yet, we want to believe that escape from destruction is possible. Like the believers in various gods who told the original legends, we maintain our fascination with the story of one family that sailed the endless sea when the world was just beginning.

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THE ACCOMPLISHED LADY IN THE ENGLISH NOVEL

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When Dorothea Brooke visits the Vatican museum on her honeymoon in Rome, she is seen by an artist who identifies her as a perfect model for a madonna. Romola, who is repeatedly apostrophized as a madonna, poses as Ariadne for a portrait. These descriptions of the heroines of *Middlemarch* and *Romola* as devotional figures and art objects allude to a view of woman often expressed in eighteenth- and nineteenth-century English novels, that a woman may be judged according to her ability to resemble a work of art, to emulate the idealized portrait of womanhood society holds up to her. Put another way, woman's aim is supposed to be self-perfection, with woman herself as both artist and artifact: To be a thing of beauty is the traditional role assigned her. However, just as the standard of beauty changes over the course of a century, so do the specifications of the traditional role. These changing specifications are illustrated in the characterizations of the accomplished lady in the English novel.

The ideal of the accomplished lady in the eighteenth-century novel incorporates an ornamental education with genteel housewifery, the willing acceptance of which is indicative of the moral character of the lady in question. The accomplishments of the lady include both the practical and the decorative crafts such as needlework and china painting. Because young ladies were taught music and drawing for specific domestic application rather than for purely aesthetic purposes, these too adorn the accomplished lady. For she ought to have been able to decorate her home with objects of her own making as well as be personally ornamental in her beauty, dress, conversation, and ability to entertain by singing a popular song or playing a reel for an evening's dance. In the nineteenth-century novel, this woman's role is still pervasive, but is accompanied by a dramatic change in the value assigned woman's work. As a result of this revaluation, woman's accomplishments increasingly go beyond the domestic sphere as a means of personal success.

Authors use fine distinctions within the range of activities accorded women to indicate the position of women in society, reflect upon changing marriage ideals, promote self-esteem among their heroines, and comment upon woman's contribution to society. The didactic attention given to women's accomplishments in the eighteenth-century novel makes them an easy target for satire in the nineteenth-century novel, but also evolves into a reassessment of the value of woman's work, the domestic craftswoman, and the woman artist. This evolution in woman's work and role forms the basis for the ensuing inquiry. Surveying a broad range of novels, including work by Richardson, Fielding, Burney, Austen, Dickens, Thackeray, the Brontes, and Eliot; and relying on the conduct books and Ruskin as reference points about the perceived role of women in the eighteenth and nineteenth centuries; I trace the evaluation of woman's work by focusing on the accomplished lady.

The conduct books present ornamental accomplishments as woman's duty along with piety, maidenly virtues like modesty, and domestic skills. The *Ladies Calling* juxtaposes ornamental and housekeeping skills with religious piety by advising women to "secure themselves by a constant serious

Employment" with that which is "worth their time: wherein as the first place is to be given to the Offices of Piety" and next

> the acquiring of any of those ornamental improvements which become their Quality, as Writing, Needle-work, Languages, Music, or the like. If I should here insert the art of Economy and Household Managery, I should not think I affronted them in it; that being the most proper Feminine business, from which neither wealth nor greatness can totally absolve them.[1]

Further, the conduct books reason that the purpose of acquiring feminine accomplishments is to secure a husband as *The Ladies Calling* indelicately adjures: "An old maid is now thought such a curse as no Poetic fury can exceed, look'd on as the most calamitous Creature in nature" (II, i, 3). A few generations later, Hester Chapone softens the phrasing, saying that a lady's accomplishments will make her "so desirable a companion" that "the neglect of them may reasonably be deemed a neglect of duty."[2] According to this circular reasoning, then, a woman's duty includes becoming both accomplished and a wife, one dependent on the other.

While the focus of the various conduct books varies, they all provide advice on the same range of activities.[3] Hester Chapone's list has more breadth than others, for she argues that women are capable of a more demanding education than is usually afforded them. She emphasizes the need for reading on the subjects of religion, history, poetry (particularly Shakespeare and Milton), nature studies, moral philosophy, and books on taste and criticism in order to be a good conversationalist; dancing and French as of equal importance; Italian—optional; handwriting and common arithmetic "indispensable"; music and drawing "as genius leads"; and a warning against the study of classical languages (III, 129-174). *Sermons to Young Women* makes a virtue of developing these accomplishments. For example, rather than simply recommending drawing and music to those who have talent, Fordyce advises young women to take up these arts as a means of entertainment for themselves and others, as well as to prevent the folly and sin proceeding from idleness. If the lady be a musician, her art must have an inspirational value. Her music should "prove a kind of prelude to the airs of paradise."[4] Fordyce finds a "moderate and discreet use" of dancing tolerable since dancing is connected with Old Testament worship, but also because the dancer is a work of art. Dancing promotes health, good humor, sociability and "that easy graceful carriage, to which Nature has annexed very pleasing perceptions in the beholders" (I, 226).

On the subjects of dress and needlework, Chapone suffices with a few words about economy and good sense, but the male conduct book writers expound on the duty and virtue in them. Fordyce goes so far as to recommend that women do needlework during conversation so as to be continually busy and as a buttress against the emptiness and gossip to which conversation can descend—almost as if the needlework were a simultaneous reparation for the sinful conversation. He adds, of needlework, that "We find it spoken of in scripture with commendation" (I, 239 and 249). The kind of advice in *Sermons to Young Women* did not go unnoticed—Fanny Burney, Susan Ferrier, and Jane Austen all allude to the work. Mary Wolstonecraft's reaction is more encompassing: "It moves my gall to hear a preacher descanting on dress and needlework."[5]

Several novels seem to put to deliberate application some of this conduct book advice on the efficacy of education and acquiring of grace, polish, and skills in order to become a companionable wife by emphasizing its importance in the courtship process. Some of Austen's heroines display their individuality and intellectual acumen—and thereby their marriageability—by debunking the poetry of sensibility and carrying on critical conversations on literature. The heroines of *Pride and Prejudice* and

Persuasion are thus quite different from the young ladies in *Evelina* who are silenced by a rebuke for expressing their criticism of a bawdy comedy. In a Victorian novel, Charlotte Yonge's *The Heir of Redclyffe,* the young Morvilles and Edmonstones are idealized for putting their education to good use by engaging in long and frequent literary discussions.

Besides serving as a lure for prospective husbands, developing the lady into a display object, and refining her virtue, feminine accomplishments have a practical-religious application in the form of philanthropy. Novelists and conduct book writers alike wax eloquent on the desirability of young ladies saving some of their pin money for good works among the poor.[6] Burney's heiress-heroine Cecilia does this in a grand way by supporting several deserving poor folk and educating impoverished young girls. In Susan Ferrier's *Marriage, A Novel,* the exemplary Scottish lady, Mrs. Douglas, busies herself knitting stockings for poor children during the hours devoted to conversation (heeding Fordyce's advice), and turns her husband's wild Highland farm into a scenic wonder by directing the labor of otherwise idle and useless children under the age of twelve. Austen scales down such enterprising generosity in *Persuasion* where the invalid Mrs. Smith earns the admiration of the heroine by selling her needlework in order to help support families even poorer than herself. Even Anne Bronte's pathetic governess-heroine, Agnes Grey, derives her only satisfaction from her charities among the poor cottagers. George Eliot, in contrast, alludes to the hypocrisy in this kind of philanthrophy by making Dorothea's relatives obstruct or ignore her attempts to give away money and design more habitable cottages for her tenants. Dorthea finally realizes that she is using the poor and even her own charitable instincts to find an occupation for her time.

The early novelists mirror the values of the conduct book writers by portraying an easy acceptance of traditional woman's work—accomplishments, education, duties—as the hallmark of an approved character, while making a woman's rejection of it a signal of her unwomanliness or immorality. Richardson's *Sir Charles Grandison,* for example, affords numerous instances when women's traditional duties are discussed in relation to their education. Harriet Byron, the heroine, was taught French and Italian as well as feminine virtues like "not to start subjects."[7] Despite her observance of this modesty, she is assigned the task of debating the pedant Walden to whom she not only proves equal in intelligence, but also defends the world as a university since women are forbidden admittance to the formal university. However, Harriet's eloquence is carefully complemented by her cultivation of feminine crafts and housewifery, even when she becomes the wife of an extremely wealthy baronet. Miss Clements, a very learned lady in the same novel, wonders why knowledge, if it "makes a man shine, should make a woman vain and pragmatical," yet she too excells in housewifery (I, 69). In Richardson, approved characters universally uphold the right of women to be educated as ability and desire prompt them, but never at the expense of traditional women's work. Echoing *The Ladies Calling,* cited above, Richardson writes to a friend that a woman who despises domestic duties "is good for nothing."[8]

Fanny Burney supports Richardson's view of the learned woman by her attack on the learned Mrs. Selwyn in *Evelina,* albeit her wit and repartee evoke a certain amount of silent admiration in the circumspect Evelina and mortify her male party—Burney firmly advocates more emphasis on modesty than agility in conversation. Evelina spends a good deal of her time in dressing her hair and attiring herself appropriately for the various social functions to which she is introduced (not surprisingly, for Fordyce devotes much of one of his first sermons to the subject of women's dress). She minds her table manners, learns the decorum of the

Ranelagh tea room, the Vauxhall gardens, the Bath parties, and practices the art of letter writing. In short, she becomes a lovely ornament, thereby earning herself a titled husband and exercising her moral virtue at the same time. In *Camilla,* Burney shifts the focus away from the cultivation of social graces and toward the development of the fine moral distinctions and domestic crafts in her heroine, though the results for Camilla are the same as for Evelina. While the beautiful Camilla devotes herself to morality, housekeeping, and needlework, her younger sister, physically handicapped as a result of a childhood fall and scarred from small pox, studies classical languages and literature which her family feels is appropriate since they consider her unmarriageable. To complete the paradigm, then, Camilla marries a moral paragon who is also a wealthy landed gentleman, while her sister is cruelly deceived by a fortune-hunting rake.

Tom Jones and *Sir Charles Grandison* associate women's accomplishments with the marriage ideal by linking the accomplishment specifically to submission to male authority. The striking example is Sophia's filial devotion to her much-inebriated, coarse, and violent father which she demonstrates by cheerfully playing over and over his favorite bawdy songs without ever becoming the least tainted by them. Sophia's incorruptibility is directly linked with her ability to delight her father, be a dutiful daughter, and play the harpsichord. Her ornamental accomplishment is thus related to her submissiveness, her most admirable quality, according to Squire Allworthy, and that which makes her an ideal marriage partner. Even Sophia's riding to hounds with Squire Western is adduced as an act of submission to please him because he likes to have her with him as much as possible; Sophia would rather read a book, since the sport is too rough for her. Allworthy apostrophizes her for this quality as "an inestimable Treasure to a good husband," since "she always shewed the highest Deference to the Understandings of Men; a Quality, absolutely to the making a good Wife."[9]

Several of Richardson's female characters protest the inequalities between men and women, but they find approval by finally submitting to male authority. Harriet Byron is incensed when Greville, one of her early suitors, attempts to exert control over her by following her to London. Later, as Lady Grandison, she commiserates with Clementina being bullied by her brothers into marrying, "as if she were not to have a will" (VI, 151), yet she chastizes Charlotte for calling her marital squabbles a "struggle for my dying liberty" (III, 390). Moreover, she entirely approves when a newly meek Charlotte turns over her personal kitty of fifteen hundred pounds to her husband as a symbol of her acquiescence to masculine authority. Finally, though offended when called upon to sing a song ridiculing the ability of women to remain constant, Harriet fulfills the request; she is one of Sophia's sisterhood, after all.

The eighteenth-century ideal of women's accomplishments as ornamental and synonymous with a high moral sense, purity, and passivity, undergoes a dramatic revaluation in the nineteenth-century novel. Austen, Thackeray, Bronte, Dickens, and Eliot all assail the value of ornamental accomplishments in order to redefine woman's role in society. Austen objects to the purely ornamental education promoted by popular moralists and novelists alike on the basis of its indefensible intellectual vacuity. The great danger in the superficial education aimed at making women display objects lies in its contamination of the moral and intellectual training afforded women also. When Emma puts her slim talent for drawing to use as a matchmaking device for Mr. Elton and Harriet, she displays ignorance of her limitations as an artist and vanity in her understanding of other people's feelings. Similarly, in *Pride and Predjudice,* Mary

Bennet's musical performance embarrasses Elizabeth less for the eagerness of its display than for the affectation and conceit which it manifests. Mary's intellectual pretentions are absurd, not because she represents the learned woman so derided in the eighteenth-century novel, but because, being deficient in understanding, she is reduced to shallow moralizing and half-understood quotation from old conduct books. Her display is little different from that of Miss Bingley who likes to walk about a room to show off her figure. Worse, the display of their slim talents has made these women vain.[10]

The conversation at Netherfield about what constitutes female accomplishments contains the gist of Austen's ideas on the subject. Bingley asserts that netting purses, covering screens, and painting tables show how accomplished young ladies are. Miss Bingley elaborates:

> "No one can be really esteemed accomplished, who does not greatly surpass what is usually met with. A woman must have a thorough knowledge of music, dancing, drawing, singing, and the modern languages to deserve the word; and besides all this, she must possess a certain something in her air and manner of walking, the tone of her voice, her address, and expressions, or the word will be but half deserved."
>
> All this she must possess," added Darcy, "and to all this she must yet add something more substantial, in the improvement of her mind by extensive reading."
>
> I am no longer surprised at your knowing only six accomplished women. I rather wonder now at your knowing any."[11]

Elizabeth's rejoinder is sometimes taken as an ironic confirmation that Miss Bingley's definition of accomplishments is correct. Taking into consideration the qualifiers "thorough," "a certain something," "more substantial," and "extensive," Elizabeth's irony must be seen first of all as a plea for reasonableness. She is not necessarily adverse to the basis on which the worldly judge sophistication, but her irony does imply a criticism of sophistication as being necessarily desirable.

Notably, the above quotation from *Pride and Prejudice* discusses the definition of "accomplishment" without association with virtue. Nor does Austen connect the degree of accomplishment in a young lady with her desirability as a marriage partner—the most accomplished ladies lose the hero as Mary Crawford and Caroline Bingley illustrate. In these ways, then, Austen departs radically from the way in which ornamental accomplishments are treated by earlier writers; however, this does not mean that she rejects the value of traditional women's work. Austen satirizes the definitions offered by Bingley and his sister because of the narrow range and unintellectual nature of activities they accord women, but she does not attack the activities *per se.* Elizabeth Bennet takes up a piece of needlework as often as a book during evening hours at Netherfield when the conversation takes a frivolous turn. The needlework of Fanny Price, the nursing of the sick by Elizabeth Bennet and Anne Elliott, the babysitting of Jane Bennet and Anne Elliott, the household management of Emma Woodhouse and Elinor Dashwood, as well as the musical and artistic abilities of characters like Jane Fairfax all recommend the characters within the context of the novels. Austen is well aware that the daily requirements of the home must be met, and she accepts this as woman's role.

Austen's neutral presentation of ladies' accomplishments is followed by Thackeray's associating accomplishments with vice. In *Vanity Fair,* Thackeray develops a bifurcated Sophia Western in his dual anti-heroines, relegating Sophia's liveliness to Becky Sharp and her submissiveness to Amelia Sedley, then filling in the other half of the characterizations with egoism, vanity, vice, and shallowness. Becky and Amelia, like

Sophia, are musicians of sorts, but there the similarity ends. To Amelia, the piano gives pleasure to no one but herself. Significantly, the piano itself rather than any music she might produce on it interests Amelia, for she is convinced it is a gift from George. Thus Thackeray uses the paradigm from the eighteenth-century novel to reveal the vanity and folly of the character. The sentimental Amelia cannot perceive George's indifference or that he would be incapable of such a generous gesture as retrieving her piano from the auction block. The piano becomes one of the items in her shrine to George's memory that helps her avert a romantic involvement with Dobbin.

By contrast, Becky Sharp uses her accomplishments to secure social success. She captivates Jos Sedley with sentimental love songs, later entertains gentleman callers at her soirees with her music, once moves Lady Steyne to tears by her rendering of the Mozart religious songs, and unsuccessfully tries to support herself by singing professionally. The best that can be said of Becky in these instances is that she manages her own destiny; she is active and resourceful on her own behalf. But Becky's activity is as full of guile as that of the rest of Vanity Fair. Through her manipulations she provides for her little family "on nothing a year" while incurring little guilt and a great deal of debt. Ironically, of course, Becky's conventional gentlewoman's ornamental talents derive from her bohemian background which ordinarily would be a deterrent to her social goals. If the emptiness of ornamental education is satirized by Austen, Thackeray clearly links it to hypocrisy and immorality.

Thackeray also reverses the association of feminine accomplishments with the marriage ideal illustrated by Fielding. Sophia's submissiveness is replaced by Becky's predatoriness and Amelia's self-pitying manipulation. As a result, Becky stalks the innocent and decent Mr. Crisp as well as the preposterous collector of Boggley Wollah. That her values coincide with those of her society, however, is indicated by the fact that no one questions the latter match—Amelia is all sentimental flutter over the prospect; Mrs. Sedley regrets only the lowness of Becky's parentage, and George interferes out of snobbery. In view of Becky's goals, it is ironic that in marrying Rawdon she both secures a fairly compatible husband and fails to make an economically advantageous match. Amelia, on the other hand, ostensibly modest, submissive, and self-sacrificing, has two-edged virtues; their possessor is morally flaccid. That these virtues are counter-productive is nowhere so clearly revealed as when they manage to get her George Osborne for a husband.

While James Fordyce preaches needlework as a woman's moral obligation and Jane Austen accepts it as a fact in woman's life, Thackeray turns it into a display of hypocrisy and vanity. Whenever Becky wants to appear domestic, she applies herself to a dirty rag of a shirt she supposedly is sewing for little Rawdon. Amelia, on the other hand, assiduously cuts up all of her own clothing into clothes for little George. Becky's lack of interest in her son is as extreme as Amelia's smothering care of hers, and both attitudes are indicated by the abuse of a traditional woman's craft. Thackeray also explodes Fordyce's dictums about the moral and practical applications of drawing as a lady's occupation. As an impoverished young widow, Amelia thinks of selling her art work as a livelihood. Not only is the market glutted with amateur art, but Amelia's pathetic and childish pictures get no buyers. Her naivete about the value of her work soon turns into despair in her situation.

Dickens completes the dismantling of the old mythology regarding women's accomplishments, and along with other Victorian novelists, revalues women's crafts in relation to woman's role in society. In *David Copperfield,* Dora, modeled after the eigh-

teenth-century ideal of the genteel lady with an ornamental education, exposes the impracticality of the ideal. Dora paints flowers while meals go unprepared, the servants pilfer from the larder, and Jip, her dog, wreaks havoc in the house. She uses her cookbook as a prop for one of Jip's tricks and bursts into tears when David attempts a few lessons in household accounts. The "indispensable" handwriting recommended by Hester Chapone, proves equally useless to Dora who copies David's manuscript by ending each page with her beautiful signature as if it were a school exercise. According to the old formulas for domestic order, the husband's duty is to develop his wife's abilities, but Dora is impervious to such help, subverting David's remonstrances by her alternate affectionate cajolement and irrational outbursts. The old ideals for the conduct of life simply do not work in *David Copperfield.*

Instead, David slowly comes to understand that the sister-angel-helpmeet, Agnes, represents the new ideal. Significantly, she is more desirable because she is more useful; her domestic accomplishments make life comfortable. She flourishes in motherhood while Dora is killed by it. The description of Dora's stillbirth is revealing: "I had hoped that lighter hands than mine would help to mold her character, and that a baby-smile upon her breast might change my child-wife into a woman. It was not to be."[12] David is interested in the efficacy of motherhood as an improver of character, but "It was not to be." Dora dies a short time after her stillborn child.

David's marriage to Agnes results in a redefinition of the feminine ideal. Romantic love, represented by David's marriage to Dora, leads to the loss of sexual innocence which in turn proves to have destructive emotional and physical effects, so David "disciplines" his heart to prefer a non-sexual mother-woman like Agnes. Agnes is the reliable counsellor to whom David turns for advice from childhood through his courtship and marriage to Dora and years of loneliness and spiritual growth. Agnes, with her little basket of keys, her father's competent housekeeper, becomes the preferred ideal. In David's second marriage, the more private and self-centered aims are submerged in the public roles of spouse, parent, and worker, epitomizing the individual as a thoroughly useful member of society.

Being useful and doing useful work is crucial to the ideal which Agnes represents. While her domesticity and motherliness might at first seem to be little different from the eighteenth-century ideal suggested by the typical happy-ever-after ending of novels like *Tom Jones* and *Sir Charles Grandison,* there is a difference. In the earlier novels, the usefulness of women's work ranks below the virtue with which it is performed—Lady Grandison's feminine submission and sense of moral obligation to be efficient and economical in her housekeeping surpass the usefulness of the work which she actually performs (the housekeeper seems to have kept up the grand establishment perfectly well for years before the arrival of Lady Grandison). However, in the work ethic promoted by Dickens and the other Victorian writers, characters actively respond to forces which affect their lives. To illustrate, when Agnes' father has financial misfortune, she takes the initiative by starting a little school.

The values approved in *David Copperfield* parallel those promoted in Ruskin's "Of Queen's Gardens," a central document on Victorian values. In this essay, Ruskin considers what portion of "power" falls to women and what kind of education prepares them for the proper exercise of this power. He urges that "a girl's education should be nearly, in its course and material of study, the same as a boy's; but quite differently directed," and he criticizes bringing up girls "as if they were meant for sideboard ornaments."[13] He does not intend that women seek knowledge for its own sake or even for their own, but rather that it will enable them "to understand, and even to aid, the work of men . . . but only to feel, and to judge" (sec.

72). Ruskin then applies this theory to the public and private duties of men and women:

> Now, the man's work for his own home is, as has been said, to secure its maintenance, progress, and defence; the woman's to secure its order, comfort, and loveliness.
>
> Expand both these functions. The man's duty, as a member of a commonwealth, is to assist in the maintenance, in the advance, in the defence of the state. The woman's duty, as a member of the commonwealth, is to assist in the ordering, in the comforting, and in the beautiful adornment of the state.
>
> What the man is at his own gate, defending it, if need be, against insult and spoil, that also, . . . in a more devoted measure, he is to be at the gate of his country, leaving his home . . . to do his more incumbent work there.
>
> And, in like manner, what the woman is to be within her gates, as the centre of order, the balm of distress, and the mirror of beauty: that she is also to be without her gates, where order is more difficult, distress more imminent, loveliness more rare.
>
> (sec. 86)

Though the modern reader may find much to fault in Ruskin's views, from the Victorian standpoint they have revolutionary significance. In effect, Ruskin assigns a social and political value to traditional women's work, making it a corollary to man's role of protecting the family and contributing to the empire. His recommendation that boys and girls be given the same course of study, though to different depths, is more progressive than the eighteenth-century idea that the subjects suitable for study by men and women are mutually exclusive. Ruskin, at least in theory, maintains that woman has a duty to the state "without her gates," although he offers no specific examples of what this duty might include.

This revaluation of woman's role manifests itself in a number of ways in the treatment of woman's work in the nineteenth-century novel. Most striking is that the purely amateurish craft, whose chief purpose is to take up time, is repudiated in favor of professionalism and useful work. In Eliot's *Middlemarch,* Dorothea's failure in her social welfare schemes and attempts to participate in Casaubon's intellectual work are all the more poignant because she rejects the old-fashioned ladies' busy work:

> . . . With some endowment of stupidity and conceit, she might have thought that a Christian young lady of fortune should find her ideal life in village charities, patronage of the humbler clergy, the perusal of "Female Scripture Characters," unfolding the private experience of Sara under the Old Dispensation, and Dorcas under the New, and the care of her soul over her embroidery in her own boudoir.[14]

Rejecting the shallow existence to be found in needlework and pious practices, Dorothea strives to overcome the disadvantages of her "toybox" education through her marriage to Casaubon. This bookish clergyman, she thinks, will open broad vistas of knowledge hitherto beyond her reach and allow her a substantive participation in his intellectual labors. However, her intelligence proves fatal even to her willingness to act as an amanuensis to her husband. Distrusted by Casaubon, disillusioned by the flaws in his "Key to All Mythologies," she suffers rebuff even in her attempts to offer him wifely consolation, affection, and understanding. Thus deprived of doing either useful work or providing psychological support to her husband, her relatives' advice that she spend her time riding and growing geraniums seems a mockery.

A strong argument for the readers who see Mary Garth as the feminine ideal in *Middlemarch* can be made of the fact that she, unlike Dorothea, succeeds at being useful. When necessity demands, Mary earns a living by doing needlework and nursing the sick. As a tribute to the ironies of life, Mary Garth writes children's books as an extension of her family life, while the large-goaled Dorothea finally has only her domestic life. For Dorothea errs in her understanding of

the helpmeet role, expecting far too much from it. In perfect agreement with the description of a wife's duties offered by Ruskin, both Lydgate and Casaubon expect their wives to be uncritically admiring of their work, but not to have any responsibility for its actual performance. What seems revolutionary in Ruskin is reactionary for Dorothea.

A second salient issue in relation to Mary Garth arises from her rejection of a teaching job in favor of remaining at home to help her overburdened mother. She agrees to take the job because of her family's grim financial situation, but is overjoyed when her father regains his local position and receives lucrative employment, thus obviating her need to work for a living. A similar situation occurs in *Jane Eyre* when Jane, who has been doing an admirable job teaching girls in a rural school, closes the school and retires to her avocations of sketching, reading, and housekeeping, when she inherits a large sum of money. The actions of Mary and Jane align with the view that a genteel person does not work for a living, but at first sight appear at odds with more progressive ideas about women's work. St. John Rivers' criticism of Jane Eyre's action says as much:

> "It is all very well for the present," said he: "but seriously, I trust that when the first flush of vivacity is over, you will look a little higher than domestic endearments and household joys."[15]

St. John is particularly interested in what Jane should consider her religious duty, to teach the ignorant and to become a missionary. Jane not only rejects his cold idealism, but finds real joy in renovating Moor House, studying, and reading with her cousins.

Anyone who knows the drudgery in a dull and unrewarding teaching position can sympathize with Mary Garth's and Jane Eyre's rejection of it. The portrait of school life and the teacher's lot given in the first part of *Jane Eyre* and in *Villette* suggest that to Bronte teaching entails far more pain than joy. Moreover, the preference for domestic life by Jane and Mary indicates how limited their alternatives are as well as carrying a note of wish fulfillment. It is not only that Jane Eyre's life at Moor House seems to include an imaginary redecorating of the Brontes' Haworth parsonage and an idealization of life there, but also a longing for independence and the artist's struggle to be free. The artist needs both time and freedom from stultifying demands in order to work. Jane's allegorical pictures, her use of sketching as therapy in order to overcome her jealousy of Miss Ingram, and her skillful portraits reveal a commitment to her art, but she can only indulge it in moments stolen from her governness work and in the leisure of Moor House where she feels "a thrill of artist-delight" as she paints (373). So too, an aspiring novelist like Bronte might long to trade her teaching duties for a self-structured work routine.

Like Jane Eyre, Mary Garth rejects teaching because she dislikes it, but Eliot does not depict the alternative as idyllically as Jane's. Mrs. Garth's life, which Mary elects to ease, consists of a dawn-to-dusk multiplicity of chores and cares. Though Mrs. Garth cheerfully bakes pies, launders clothes by hand, and teaches her younger children their lessons all at the same time, her life is unenviable. Yet for Mary, a daughter's duty and family happiness offer more personal satisfaction than she can find in school teaching. Woman's traditional work has a positive value for her.

When traditional women's work has merely an ornamental value, however, Eliot wastes no effort in defending it. Unlike Dorothea who has the author's sympathy for endeavoring to make her life effective, Rosamund Vincy in *Middlemarch* and Gwendolyn Harleth in *Daniel Deronda* earn her censure for failing to recognize their limitations. For Rosamund, this means her assumption that her finishing at Mrs. Lemon's school, even including the "extras, such as the getting in and out of a carriage" (I, 143) prepares her for the exigencies of

marriage. Marrying the nephew of a baronet "offered vistas of that middle-class heaven, rank" (I, 177), so great that she even discounts her own reservations about Lydgate's low-status medical profession and disgusting (to her) research. Having paid so much attention to furnishings and refinements, Rosamund responds predictably to Lydgate's revelation about their debts with "'What can I do?'" and with her attempts to subvert his professional goals by urging him to set up a fashionable practice in London.

Gwendolyn Harleth errs in confusing the depth and purpose of her lady's training. The utter folly of her belief that she can dominate Grandcourt indicates how little intellectual acuity her education has given her, nor has it given her any practical skills. An over-rated sense of her personal worth and character strength leads her not only into a devastating marriage, but numerous smaller mistakes. When Gwendolyn thinks she can become a professional singer because she is a lady—which she assumes qualifies her for "a high position" on the stage—Herr Klesmer lectures her at length on the qualifications of a professional actress and singer, starting with the need for talent and years of dedicated training.[16] After marrying, when Gwendolyn again thinks of taking singing lessons, Grandcourt scoffs at her motives and the likely result, that she will make a fool of herself by singing for her guests: "'Amateurs make fools of themselves. A lady can't risk herself in that way in company. And one doesn't want to hear squalling in private'" (III, 65). The element of justice in this chastisement stings her all the more by coming from the odious Grandcourt as well as vivifies the criticism of ornamental education for making women superficial and naive.

Occasionally, however, amateurism can lead to professionalism. Such is the thesis offered by Anne Bronte in *Tenant of Wildfell Hall,* one of the first portraits of a woman artist. Though the focus of the novel is on the plight of the innocent wife of an incorrigible dissipate, Helen Huntingdon's professionalism is well marked. She determines to become an artist in order to support herself and her son and escape from her husband. First, she realizes, she "must labour hard to improve [her] talent and to produce something worthwhile as a specimen of [her] powers."[17] She sets up her easel and works from morning to night until her husband destroys her work and prevents her from obtaining new materials. When he installs his mistress as his son's governess, she takes the bold step of decamping with her son, servant, and baggage.[18] Then posing as the widowed Mrs. Graham, she sets up a studio at Wildfell Hall, turns out landscapes, secures a London agent, pays her debts, and wins the admiration of her friends and relatives. Left a wealthy widow after her husband's death, Mrs. Huntingdon apparently abandons her art for the management of her estate, but this suits Bronte's characterization too. Mrs. Huntingdon is a professional, whatever her occupation is.

A second, rare consideration of the professional woman artist occurs in *Daniel Deronda.* In this novel, Daniel's mother consciously chooses her profession and achieves great success as a singer. To do so, though, she has had to flaunt convention. Explaining the difficulty of being both a woman and an artist, she makes a passionate defense of her abandonment of her son, husband, marriage, and religion in order to pursue her art, partly because marriage was forced upon her by her parents. She argues for a need and right to be free, for her talent and aspirations are unconventional:

> I was a great singer, and I acted as well as I sang. All the rest were poor beside me. Men followed me from one country to another. I was living a myriad of lives in one. I did not want a child.
>
> (III, 123)

> . . . you can never imagine what it is to have a man's force of genius in you, and yet to suffer the slavery of being a girl. To have a pattern cut out—"this is the Jewish woman; this is what you must be; this is what you are wanted

> for; a woman's heart must be of such a size and no larger, else it must be pressed small, like Chinese feet; her happiness is to be made as cakes are, by a fixed receipt."
>
> (III, 131)

Eliot allows the character to speak for herself. Daniel makes no comment on the validity of his mother's position. She has chosen her own life, defends it, accepts it; the reader may do the same. Eliot's presentation of this character takes us far from Fordyce's moralizing about needlework and music. If music be woman's work, Eliot's character implies, let it *be* work, and it will have value.

However, Eliot will not allow so simple an alternative as either to accept or reject the justice of the claims of Deronda's mother. Instead, she offers the portrait of Mirah Cohen, who on the verge of brilliant success as a singer also, abandons her career for marriage to Daniel and dedication to Zionism. Beautiful, talented Mirah marries the hero and opts for the conventional life; beautiful, talented Mrs. Deronda opts for her profession and forfeits the conventional life. A parallel situation arises in Eliot's earlier novel, *Adam Bede,* when Dinah gives up preaching after marrying Adam. In Eliot's novels, the roles of professional artist and wife are mutually exclusive.

In fact, it is the rare Victorian novel which explores artistic endeavor as a means of livelihood.[19] Instead, novelists prefer to use the commonplace activities of women to depict the position of women in society, the marriage ideal, and individual values. This preference may reflect the authors' attempt to present a realistic picture of middle class life, in effect, to preserve an artifact of the popular novel. The Victorian novelists depart from the didacticism of the eighteenth-century novelists by dissociating the personal rectitude of their heroines from the degree of their attainment of ornamental accomplishments as when Dickens separates the romantic and conjugal ideal in Dora and Agnes. Victorians, aware of the vapidness to which eighteenth-century ornamental education can lead a woman, disapprove of women who view themselves as works of art.

Woman in the eighteenth- and nineteenth-century novel tends to be defined by and confined to her traditional crafts. From an historical perspective, the novel offers few happy or realistic alternatives to being an ornament, an accomplished lady, or a genteel housewife. The genteel women's occupations which occur in novels, those of governess and school teacher, result in a dismal life joyfully traded at the earliest opportunity for those of wife or amateur artist.[20] The artistic professions mentioned in the novels are those which grow out of women's traditional accomplishments, but ironically, these professions offer one of the most difficult means to success: Who can assure the aspiring painter, novelist, actress, or musician a secure future? In reality, too, artistic professions are unlikely alternatives for they would undoubtedly result in a bohemian life outside the boundaries of the genteel characters who might be inclined to them. In the Victorian novel, women's traditional work may be either an ideal or a limitation, but seems to be one from which there is no escape.

Notes

[1] Richard Allestree, *The Ladies Calling* (Oxford: Theater, 1673), Pt. II, i, 7. Further references are in the text.

[2] Hester Chapone, *Letters on the Improvement of the Mind* in *The Works of Mrs. Chapone,* 4 vols. (London: Murray, 1807), III, 15. Further references are in the text.

[3] Thomas Gisborne has a somewhat hostile tone as he chides women who complain that men and women are given unequal education; he divides women's education into religious instruction and that "on the score of ornaments," but concentrates largely on woman's duty to provide for the needs of other family members in *An Enquiry into the Duties of the Female Sex,* 11th ed. (London: Cadell and Davies, 1816), pp. 10, 79, ff. Most conduct books, however, have a rather paternal tone.

[4] James Fordyce, *Sermons to Young Women,* 2 vols. (London: Cadell, 1791), I, 255 and 262. Further references are to this edition and are cited in the text.

[5] *Vindication of the Rights of Women* (New York:

Norton, 1975), p. 94. Without acknowledging his source, Villars uses Fordyce's words on woman's virtue in advice to Evelina in Fanny Burney's *Evelina* (London: Oxford Univ. Press, 1968), p. 164. Austen parodies the same advice in *Pride and Prejudice* when Mary moralizes on Lydia's elopement. In Susan Ferrier's *Marriage, A Novel,* Lady Juliana's refusal to read Fordyce's *Sermons* is one of many examples of her frivolity (London: Oxford Univ. Press, 1971), p. 60.

[6] E. g. Dr. John Gregory, *A Father's Legacy to His Daughters* (1774; rpt. Boston: Dow, 1834), p. 23.

[7] *The History of Sir Charles Grandison,* Shakespeare Head Ed., 6 vols. (Oxford: Blackwell, 1931), I, 20. Further references are to this edition and are cited in the text.

[8] *Selected Letters of Samuel Richardson,* ed. John Carroll (Oxford: Clarendon Press, 1964), p. 177. Moralists and novelists of the eighteenth century generally agree that women could be allowed to learn what men were taught if they had particular genius; however, the learned lady was supposed to conceal the fact of her learning and complement it with well-developed domestic skills. Cf. Lady Mary Wortley Montague cited in Robert Palfrey Utter and Gwendolyn Bridges Needham, *Pamela's Daughters* (New York: Macmillan, 1957), pp. 29-30; Lord Chesterfield, *Letters to His Son,* ed. Oliver H. Leigh, 2 vols. (New York: Tudor, 1941), I, 107-108; Gregory, p. 20; Charlotte Smith, *The Old Manor House* (London: Oxford Univ. Press, 1969), pp. 186-188.

[9] Henry Fielding, *The History of Tom Jones A Foundling,* ed. Fredson Bowers, Wesleyan Ed., 2 vols. (Middletown, Conn.: Wesleyan Univ. Press, 1975), II, 882-883.

[10] Lloyd W. Brown, "Jane Austen and the Feminist Tradition," *Nineteenth-Century Ficiton,* 28 (1973), 321-338; Brown compares Mary Bennet and Caroline Bingley in some detail.

[11] *Pride and Prejudice,* ed. R. W. Chapman, 3rd ed. (1931; rpt. London: Oxford Univ. Press, 1967), pp. 39-40.

[12] *The Personal History of David Copperfield,* The Oxford Illustrated Dickens (1948; rpt. London: Oxford Univ. Press, 1971), p. 698.

[13] "Of Queen's Gardens," in *Sesame and Lilies* (Boston: Houghton Mifflin, 1900), sec. 74 and 80. Further references are to sections and are noted in the text.

[14] George Eliot, *Middlemarch,* Cabinet Ed., 3 vols. (Edinburgh and London: Blackwood, 1878), I, 39. Further references are to this edition and are cited in the text.

[15] Charlotte Bronte, *Jane Eyre* (London: Oxford Univ. Press, 1973), p. 395. Further references are to this edition and are cited in the text.

[16] George Eliot, *Daniel Deronda,* Cabinet Ed., 3 vols. (Edinburgh and London: Blackwood, 1878), II, 375-398; Ch. 23. Further references are to this edition and are cited in the text.

[17] Anne Bronte, *The Tenant of Wildfell Hall* (Harmondsworth: Penguin, 1979), p. 358. No standard edition of this novel is available.

[18] The independence and decision of Helen Huntingdon should not be underestimated. The novel was written in 1848 when husbands had complete legal control over wives and children. When Dickens separated from his wife in the 1860's, he maintained control of all of his property, keeping his home, his children, and his wife's sister as housekeeper, while his wife was sent off to a small flat where all but her eldest son were forbidden to visit or correspond with her. See Edgar Johnson, *Charles Dickens His Tragedy and Triumph,* 2 vols. (New York: Simon and Schuster, 1952), II, 918-926 and 1064.

[19] Zelda Austen notes the consistency with which authors of autobiographical novels tend to cast their fictional selves as "something more commonplace than genius," preferring to universalize themselves for the sake of realism; "Why Feminist Critics Are Angry with George Eliot," *College English,* 37 (February, 1976), 553. In *Literary Women,* Ellen Moers argues that Mme. de Stael's *Corinne* served as a model for several other nineteenth-century works about "the woman as genius"; (Garden City, N.Y.: Anchor Books, 1977), Ch. 9.

[20] Nursing, a traditional woman's task noted in the conduct books, practiced by various characters within the domestic setting (e.g. Anne Elliott in *Persuasion* and Agnes in *David Copperfield*), and professionalized by Florence Nightingale during the Crimean War, fails to be recognized by novelists as an occupational alternative for a heroine, probably because of the generally low status of the medical profession up to the end of the nineteenth century.

THE CAPTAIN OF COMPANY K FIVE WARS LATER

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The Captain of Company K, by Joseph Kirkland, was published in 1891, four years before Stephen Crane's *The Red Badge of Courage.* Crane was not a veteran of the Civil War, but Kirkland was. While both novels exhibit the new tendency toward realism in American fiction, *The Captain of Company K* lacks the pervasive irony and naturalism of Crane—perhaps because Kirkland, a generation older than Crane, was also a veteran of The Great Sentimental Age. He is therefore an intriguing transitional figure, presenting war graphically but within the context of a conventional popular romance novel which would not have been out of place during and immediately before the Civil War. This may partly explain the artistic inferiority of *The Captain of Company K,* lacking as it does the unity, focus, and intensity of Crane's Civil War novel. Being an uncongenial juxtaposition of fiction and the author's feelings, attitudes, and recollections, *The Captain of Company K* may have little to offer as art, but as a statement and reminiscence by a Civil War veteran it has high historical and current interest.

Kirkland's novel deserves its neglect in literary history also because its characters are stereotypes—and this notwithstanding, many of them are still hardly distinguishable from each other at times without their highly artificial and overdrawn dialects, accents, and mannerisms—and because its plot is merely a series of individual incidents related to the unsatisfyingly predictable stock plot of a man winning a woman. Little illumination is thrown upon this man-woman dynamic, however; the book's interest lies in its war scenes and the author's attitude toward them.

Will Fargeon, a mild and humanitarian man, has been courting Sara Penrose, the typically beautiful and somewhat vain and heedless elder daughter of a well-meaning befuddled clergyman. Will is persuaded by a typical Scottish uncle, Colin, to back up his own Union rhetoric and enlist, whereupon Company K of Chicago's Sixth Illinois fills immediately and elects the sterling but peace-loving Fargeon its captain. Fortunately, Fargeon's first lieutenant is "Mac" McClintock, an ideal soldier and wise veteran of the Mexican War. Will becomes a new man, a real man perhaps, during the first year of the war, and Sara and he declare their love for each other. Meanwhile Will and Mac become closer than brothers. At Shiloh Will loses part of a leg and Mac is apparently killed. Lydia, Sara's younger sister and a typical second daughter, has fallen in love with an appreciative Mac, and the loss seems tragic. However, Mac had not been killed after all and returns from a Southern prison. There are two weddings, Will and Sara inherit Colin's fortune, Mac becomes a career soldier and never gets his deserved promotion, Will becomes a surgeon and continues to clump around on the same wooden leg he got after Shiloh and saves the bloody shirtsleeve he used as a bandage, and the public goes on with its booming postwar business and couldn't care less.

But the author invites us to look at his work as a personal document, and therefore we can go far beyond his vacuous plot and characters. He refers to the Union soldiers as "our" men and describes events as if he were an unnamed participant. He uses the first person at times: "God! If I wanted to magnify the pathos of all this, what could I say that would not belittle it?"[1] (220), and

throughout makes direct statements about war: ". . . [which is] fortuitous death by an unseen missile from an unknown hand . . . But to the average American brutal battle is better than irksome idleness." (83)

It is not the empty wit of the characters' dialogue that is interesting; it is rather the dialogue within Kirkland's own voice (such as in the quotation above) that intrigues. On the one hand Kirkland gives the reader sometimes rhetorical, sometimes vivid, statements on the evil of war. "Why are men so foolish," is the unconsciously telling question that Sara asks as the story opens. As the company's first skirmish is described Kirkland asks, "Is not the time coming when the rank and file . . . will . . . learn good sense . . . [and] cry with one voice: 'It is enough. We will have no more of it.'" (83) In that skirmish one of the men is not permitted to stop and care for his brother, who has just been shot:

> "I don't care if he's your sister! Drop him and take your gun!"
>
> Poor Aleck obeyed; laid down his burden, tenderly kissed the pale face, rose with tears streaming down his face, loaded his piece, crying. Still crying, went forward to the firing line, and cried and fought, fought and cried, as long as there was any fighting to do. Country —duty—glory? (99)

In a crucial scene, a party of truce delivers news to a dignified Confederate (Kirkland declines to capitalize the c) officer that his son is mortally wounded. The boy is "Young, strong, handsome, high-bred—curls, that might have been the pride of a doting mother . . . Eyes fit to shine as the heaven of love and trust to some happy bride." This sentimental description is followed by: "A bullet had torn clean through his lungs, and the breath made a dreadful noise escaping through the wound at every exhalation." (104) A little later Will glimpses a man's wounded hand: ". . . a broken bone, and bloody skin and flesh both fat and lean," and feels "a little nausea." (118) "Oh, how can a just God permit such things?" he cries (119), and not for the last time. The brother of the man described earlier dies and is hastily buried:

> Our forces did not hold this position; and after we retired it is probable that some enemy found the spot and destroyed the simple record, or perhaps the wood-fires burned it, or hogs rooted it up. But what difference did that make? Nobody ever went back to look for it. (135)

In the description of the battle of Shiloh Kirkland writes:

> How do men fall in battle?
>
> Forward, as fall other slaughtered animals . . .
>
> As they fall, so they lie, so they die and so they stiffen; and all the contortions seen by burial details and depicted by Verestschagin and other realistic painters are the natural result of the removal of bodies which have fallen with faces and limbs to the earth, and grown rigid without the rearrangement of "decent burial." (279)

And he quotes Cowper: "War is a game which, were their subjects wise,/Kings would not play at."

Is *The Captain of Company K* an anti-war novel, then? Just before the Cowper quotation, Kirkland says, "Then one must pause to remind himself that war did not invent death; nor does even blessed peace prevent it." Then are the anti-war statements merely items which are conventional in a war story of the late nineteenth century? Kirkland suggests that his conscious purpose may have been to give his readers "an education . . . concerning the realities of war from the point of view of the front-line men." (158) This purpose would permit more than one feeling about war to be expressed, but perhaps Kirkland also has a less conscious attitude toward war which is not as ambiguous, and discoverable.

War does have its good aspects. Will Fargeon displays upon his enlistment a new and deeper quality, which others perceive in his face. (15) There is the bond Will begins to feel toward his men, and the affection and sense of responsibility that ensue: army life seems to be as pleasant as the feeling of love

he has for Sara—in fact one day he doesn't even open a package from Sara as long as he is busy with the men (71); the conversation among soldiers can be sheer delight (73-74, for example); war teaches the difference between bravery and courage (86); nobility is tested and can be encouraged (112); civilian life is by contrast intricate and exasperating (152); the fatherly and brotherly aspects of a man can be brought out by army life: Will and Mac once went "stealing along the sleeping line of Company K, slipping two biscuits and a bit of pork into every sleeper's haversack" (183-4); and in a very effective scene where Will stays behind enemy lines with his bleeding Irish corporal and cradles the dirty, smelly body to his own against the wet and cold (194ff) we see the selfless devotion war can call up among fellow sufferers.

But more important than all these to Kirkland seems to be the summation: war, in its terrible glory and its tragic, brutal beauty, is larger than peace. We see the aging Will Fargeon at the end, still devoted to his war experiences, memories, and friend, and know that war was the main event of his life. We see almost nothing of his civilian, married life after the war. Was Will as bored by the Fargeon home as it seems Kirkland was? War was intense, it was *life;* if often horrible, then life, real life, is often horrible. Peace is blessed but pale; peace is a washed-out mere absence of war. Peace has offered little to the reader—contrived, wooden, and unreal conversations among stereotypes—but war was interesting; to the characters themselves peace offered little—but war developed them and gave them something to do and to feel.

Before a conclusion is drawn from this, some other valuable aspects of the novel should be outlined. An historian would find many fascinating items of Civil War minutae, ranging from how soldiers positioned themselves in sleep so as to keep their equipment dry in wet weather to how cannon fire sounded. The battle descriptions are excellent. Here is part of the description of how the surprise morning attack by the Confederate army at Shiloh looked to a unit not in a forward position:

> "Hellow, Mac! What's all this? Somebody else is reconnoitering I guess." For the sharp, untimely musketry persists in making itself heard from the outposts. Mac looks glum and anxious. He hurries up all the morning operations with asperity and profanity not usual with him.
>
> The rattle of musketry becomes more and more steady and continuous. Scattered men without muskets begin straggling down the road toward the rear. . . .
>
> . . . the road is growing fuller and fuller of fugitives; here and there a wagon or ambulance, but chiefly infantry-men walking or running toward the river. . . .
>
> Still that rising approaching rattle of musketry . . . The distant sound of cannon has been heard some time; now comes the welcome thunder of a battery which has opened fire from our own side . . .
>
> . . .
>
> As the men gather on the color line in response to the long roll, they see the other regiments in the brigade hurriedly striking tents and scrambling them into wagons as best they can . . .
>
> . . .
>
> By this time the road has become a pandemonium of flying forces. Wagons go galloping in the rear in a nearly continuous stream, while *twice* there comes a yet more harrowing sight—the flight of caissons, forge and battery wagon; *but no limbers and no cannon!*
>
> . . . Already bullets have made themselves heard . . .
>
> . . .
>
> Now the wild yell of the enemy is audible, beginning far away on the left and spreading toward them. Now it is directly in front . . .
>
> . . .
>
> . . . A movement in the underbrush is perceptible, a glimpse of butternut . . . (269–276)

It is also fascinating to see the soldiers described: the jokers, the skulkers, the officers, Grant, the enemy (gallant but blindly hostile), the soldiers from other states referred to with appreciation, the political appointee officers; what the soldiers

did in camp and how they talked, and what they did and thought in battle. The helpful/indifferent home front is seen, along with painfully stereotypical blacks and Jews. Significantly, the war's issues are absent—which is realistic enough; blacks are not only unimportant but when seen are childish, ignorant and comical. Business is rapacious, newspapers are unscrupulous, Washington is incompetent—and after the war the soldiers are forgotten by all three. Women are sentimentalized, but we see how even in the North they helped inspire war. The surprising etiquette, even between enemies, of the early years of the war is shown. We glimpse immigrants and feel Kirkland's affectionate but condescending attitude toward them.

Of great importance is Kirkland's position relative to the sentimentality of the age he comes from and the realism of the age he is moving into. Women, Mother, grief and loss are sentimentally regarded, as is appropriate to American society of 1860, but battle, wounds, the political and economic systems are rendered realistically (and the author seems to be quite consciously doing so.) This is a key to evaluating Kirkland's attitude.

In the scene dealing with the Confederate officer learning of his son's mortal wound we read:

> The grief-stricken father never raised his hand to his eyes; but his frame wavered a little, and from time to time he bowed his head and shook it slightly, when one or two scattered drops would shine for an instant in the sun as they fell to the ground. (109–110)

This scene is significant because the approach is sentimental; that is to say, the author dwells on the pathos of the scene, and the tragedy of wounding and loss and war in general, and even shows us the regret and depression of the decent man who shot the Confederate officer's son—but the evil inherent in the situation has disappeared. It is pathetic that the young man was mortally wounded, but we do not hear about whether it was good or evil to have shot him. The basic issue (if the basic issue is a moral one) is covered by valid sentiment—but covered. Perhaps this is why Walker Percy says that a sentimental people is a cruel people, and why the Great Sentimental Age produced and/or permitted such a cruel war. Pain and grief are described in the novel, but killing is not discussed (except that Sara at one point lightly suggests that Willie might be changed to "Killie.") In this regard the *Captain of Company K* is inferior to, for example, Howells' "Editha," in which the prime issue is not death and suffering but killing.

War is interesting. There is a "joy of battle" (303) against the intense glare of which peaceful life appears hopelessly dull. Kirkland expresses this fact honestly, though he does not deal with the question of whether the contrast is so obvious because war is more real than peace or because our civilian conduct is weak and foolish. Perhaps the validity of Kirkland's observation says more about peace as we manage it than about war.

Kirkland's attitude displays human nature. It does not affirm the health of the human animal, but it does show us its consistency: feelings similar to Kirkland's are expressed in some recent Viet Nam fiction. We are now ready to regret the neglect of veterans which Kirkland also decries, and we are willing to praise the comradeship and character development one can find in the military. We can begin to understand why some soldiers re-enlisted for another tour in Southeast Asia, and we are even ready to use the words "honor" and "country."

Kirkland's novel will always be interesting, but it is especially illuminative now. At some times a country is in the frame of mind to honor those who waged and endured a war more than it is to honor those who opposed and protested it.

Note

[1] Joseph Kirkland, *The Captain of Company K*, Ridgewood, N.J.: The Gregg Press, 1968. Reprint of 1891 Dibble Publishing Company edition. (Page numbers given in parentheses.)

THE RARE BOOK DEPARTMENT OF THE UNIVERSITY OF WISCONSIN-MADISON: ORIGINS AND EARLY DEVELOPMENT, 1948-1960

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INTRODUCTION

Although it was eventually to become a department with collections of national significance, in addition to providing direct and important services to the university community in meeting its teaching and research needs, at its inception the Rare Book Department (hereafter RBD) of the University of Wisconsin-Madison ran the risk of becoming and remaining a stepchild of the university library. Through the continuing definition and development of its functions the RBD became, during the period 1948-1960, an integral part of the University of Wisconsin community and developed a role extending to the wider city and state community.

At the outset two basic principles governed the RBD's development—the collections were increased for the most part in areas of strength, and these same collections were developed with the intention and expectation that they be used and answer to the research and teaching needs of the faculty and students of the university. The latter may seem an obvious point, yet it indeed needs to be made owing to the common belief that a rare book department consists of a collection of items preserved for their financial value or antiquarian interest alone.

ORIGINS

The Rare Book Department was formed as a direct result of the acquisition of the library of Chester A. Thordarson by the University in 1946. The purchase price to the University was $300,000, a substantial sum for the time. Yet the library was considered well worth the price—it was probably worth a good deal more—and through the efforts of a number of persons lobbying for its purchase, the Board of Regents was convinced to vote its approval on January 19, 1946.[1] E. B. Fred, President of the University at the time, was to say in an interview in 1976 that the Thordarson Library "was the best investment the University ever made."[2]

Chester A. Thordarson was born in Iceland in 1867 and came to Milwaukee with his family in 1873. His father died shortly after the family's arrival in Milwaukee and his mother and her children went on to live in Deforest and Shawano, Wisconsin, moving to North Dakota in 1879. Thordarson, born Hjörtur Thórdarson, received his brief formal education in Chicago. He left school after completing the 7th grade at the age of 20 and continued his education through self-study. After working for a number of electrical companies in Chicago and St. Louis, he formed his own electrical manufacturing company in Chicago in 1895. The success of this self-educated and widely acclaimed genius was great and rapid. He was awarded more than 100 patents during his career and won gold medals at both the Louisiana Purchase exposition in St. Louis in 1904 and the International Panama-Pacific Exposition in San Francisco in 1915.

Thordarson acquired an interest in books and learning early and maintained this interest to an extraordinary degree throughout his life. He amassed a systematic collection of significant works in the development of early English science and technology in first and early editions which received wide attention. Fields well represented in the library include Agriculture, or Husbandry, Natural History, Medicine, Mathematics, Botany, Ornithology, Electricity and Magnetism,

and Domestic Occupations. The collection of magnificent large color-plate books in Ornithology and Botany is remarkable. In addition, important works in English literature are well represented. The books were without exception very well preserved and Thordarson had many rebound in full or three-quarter leather by the well-known binder Rivière and Sons.[3]

The course of events leading to the acquisition of the Thordarson Library can be divided into two periods: interest on the part of the University while Thordarson was still alive; and lobbying efforts after his death to convince University administrators to support, and the Board of Regents to approve, its acquisition from his estate. There is little evidence concerning the first of these periods; and, although the actual initiation of the lobbying efforts also remains unclear, the course of these efforts can be described in some detail.

Thordarson had various associations with Wisconsin. His family lived here during their first years in this country. Later, Thordarson designed laboratory equipment for the faculty of the University, addressed classes on a number of occasions, and was awarded an honorary Master's degree in 1929. Finally, he owned and, after 1941 housed his library on, Rock Island, Wisconsin (now a State Park). His library had received some attention in the popular press as well as in the *Papers* of the Bibliographical Society; and as Thordarson himself indicated in a letter to Clarence Dykstra, President of the University, he had encountered active interest in his library from many parties.[4]

Beginning in 1942 it is possible to document the University's early interest in Thordarson's library. Gilbert H. Doane, Director of Libraries, prepared a draft of "Memoranda for an Agreement between Chester H. Thordarson and the Regents of the University of Wisconsin" in 1942.[5] This agreement proposed the donation by Thordarson of his library to the University. This draft agreement was then revised by A. W. Peterson, Comptroller, and submitted to President Dykstra.[6] A possible third version, "An Agreement Between Chester H. Thordarson and the Board of Regents," was submitted in November 1943.[7]

It is clear from all this that Dykstra was preparing to pursue the matter with Thordarson, but this agreement was never carried out. In a confidential memo to President Fred from Peterson, dated July 6, 1945, Peterson made reference to a concern of Trigg Thordarson (one of Thordarson's two sons), about a memorandum signed by Thordarson and Dykstra on November 12, 1943. This may have been the agreement last referred to above, but no memorandum of this date has been found over the signatures of these two men. In any case, Peterson assured Trigg Thordarson that the University would take no legal action.[8] Furthermore, Thordarson's letter to President Dykstra dated December 11, 1943 makes it clear that Thordarson had indeed not agreed to Dykstra's proposal as of that date.

In this letter, the only known statement by Thordarson on the subject of the disposition of his library, he writes in a somewhat rambling style about his library and its importance to his study of nature on Rock Island, the interest people have shown in it, and his "plan" for the library. This "plan" is of greatest interest here, but it unfortunately remains rather vague. Thordarson was clear about one thing, however, stating "I never use the word 'donation.' I couldn't because I never thought that way." His plan seems to have been to avoid the issue of "legal ownership" and to follow the plan of the Huntington Library in Pasadena, whereby an agreement with the state (according to Thordarson) provides "that the library is to be used as a semi-public institution and that they are exempted from taxation." Just what he meant by "they are exempted from taxation" is difficult to understand. Jens Christian Bay of the John Crerar Library was carrying on the correspondence with the Huntington Library for Thordarson. Thor-

darson intended to see Bay and "get from him a clear and definite summary of the plan and what has been done." Some light is shed on this near the end of his letter where he states "I still hope that I can find a way to establish a fund that would take care of the library for all time to come. This is my idea and I would not need any financial support from the University." From these statements we can infer that Thordarson's "plan" was to set up a fund to support the library, that the library be a semi-public institution, and that the fund not be subject to taxes.[9] Nothing came of this plan, yet interest did not die out, although an agreement was never reached with Thordarson, who died on February 6, 1945.

It is possible to identify several key figures in fostering the University's interest in the Thordarson Library as well as key steps leading to the University's final decision to acquire the library. President Fred and Professor William S. Marshall of the Zoology Department became interested at the outset. In a letter of May 15, 1945, Marshall informed Doane that "President Fred thinks there may be a chance of our getting the Thordarson Library, a few of us are trying to help him . . ."[10] He asks Doane for a description of the library and requests that he send Fred a letter. This he quickly did, as acknowledged in a letter to Doane from Marshall dated May 30, 1945, wherein he stated that Doane's and Professor Wagner's letters were "very good."[11]

A very important meeting took place at the Crerar Library in Chicago on November 15, 1945, at which Bay described to Doane, Ralph Hagedorn, Acquisitions Librarian, and A. W. Peterson, Director of Business and Finance, the unique importance of the Thordarson Library and its value as an investment.[12] It was at this meeting that Peterson's enthusiasm was restored and, as Doane reported to Bay on November 24, 1945, "the next morning we were able to win over the President. There remains the task of convincing the Board of Regents, but thanks to you, I now have two powerful allies in the president and the director of business and finance."[13]

Possibly the most important step toward convincing the Regents took place at a conference Doane had on November 27, 1945 with D. Clark Everest, President and General Manager of the Marathon Corporation of Wausau, Wisconsin, and Allen Abrams, Vice-President and Technical Adviser.[14] At this meeting Everest agreed to write to regents F. J. Sensenbrenner, Michael Cleary, and Walter Hodgkin. This he did, and Sensenbrenner, in response, reported that his letter "was read to the membership of the Board of Regents in executive session and I am hopeful with you that we can secure the library."[15] The Regents authorized the signing of an option agreement on January 19, 1946 and such an agreement was signed on January 21, 1946, providing for "a consideration of $270,000 for the purchase of the Thordarson Library and a broker's commission of not to exceed $30,000."[16] In a letter to Bay dated February 1, 1946, wherein he thanks Bay for his help in the transaction, Doane makes it fairly clear that Everest's influence was of consequential importance stating "Fortunately, one of our paper barons recognizes a book when he sees it and through him the President was able to convince some of the businessmen on the Board of Regents."[17] The Board of Regents exercised its option in December 1946 and the Thordarson Library came into the permanent possession of the University, although it had already been moved to Madison in August of that year.

Of the more than 11,000 volumes in the original Thordarson Library, fewer than half were to make up the foundation collection of the Rare Book Department, which came into being nearly two years after the final purchase of this important library. The other books, consisting mostly of reference works, secondary materials, collected edi-

tions of standard authors, and most of Thordarson's fine collection of Icelandic books, went into the general collection, while the Americana went to the State Historical Society Library. The volumes which made up the nucleus of the RBD formed the essence of the Thordarson Library and consisted of those books "which are genuinely rare; those which require special care (such as color plate books); and the important editions of scientific books which, although often not notably scarce at the present, should be preserved for future generations."[18]

Staff

From 1948 to 1960 there were three curators of rare books. Throughout this early period of the RBD the support staff in the department varied in number, length of service, and type of position. For the two years of the first curator's tenure and the first two years of the second curatorship, there was no assistance at all. Both curators referred to this situation in their annual reports pointing out that it was not possible to provide proper service so long as the department remained a "one-man" operation.[19]

Assistance first came in 1952 with the hiring of a student as a temporary library assistant. The first professional assistant began on April 2, 1954, nearly six years after the naming of the first curator. Over the years there were appointments of assistants in the department with varying titles, some of them clerical, others professional, and still others falling between these types, e.g. project assistant. The following list includes in chronological order of their appointment all the staff members who worked in the RBD from 1948-1960 together with their titles and inclusive dates of service:

Ralph Hagedorn, Curator, 1948-1950
Samuel Ives, Curator, 1950-1958
Carllyn Anderson, Temporary Library Assistant, July-Aug. 1952
Klara Cook, Project Associate, October 1952-June 1953
Donna Grooms, Student Assistant, Oct. 1952-Jan. 1953; Library Assistant, Feb. 1953-?
Aaron Polonsky, Assistant to Curator, April 1954-April 1956
Jeremiah O'Mara, Assistant to Curator, June 1956 (one week only)[20]
Edward Grant, Project Assistant, Aug. 1956-Feb. 1957
Garrett Droppers, [Project Assistant], Feb. 1957-Jan. 1958
Dorothy Handley, Assistant to Curator, Feb. 1958-
2 part-time student assistants, Spring 1958
Felix Pollak, Curator, Summer 1959-

The position "Assistant to the Curator" was a professional position. Ives, in making his recommendation for a full-time professional assistant in his first *Annual Report* (1950-1951), described the qualifications he had in mind. The assistant should be a "well trained cataloger, efficient, thoroughly reliable in all things, and with an appropriate background and enthusiasm for rare books." A full-time assistant was provided for in the 1952/53 budget, but none was appointed until April 1, 1954. Grant and Droppers, the two Project Assistants who filled in after O'Mara's unexpected resignation, until the hiring of a new Assistant to the Curator, were both graduate students in the History of Science Department of the University.

The curator's position originated when the Board of Regents created the position "Curator of the Thordarson Collection" for the 1947-49 biennium. This position was not filled, however, until September 1948 when Ralph Hagedorn was hired as curator. The title of the position was changed to "Curator of Rare Books" when the decision was made early in 1949 to establish a separate RBD with a major portion of the Thordarson

Library serving as its nucleus. Hagedorn, who had been Acquisitions Librarian, immediately went on a study trip to acquaint himself with rare books librarianship. From October to December 1948 Hagedorn studied at Harvard's Houghton Library and visited rare book libraries between Cambridge, Massachusetts, and Washington, D.C. During his tenure as curator he had to contend with the initial organization of the collections, while at the same time trying to provide services to the public. At this time the RBD occupied Rooms 324 and 325 of the State Historical Society Building, where it was to remain until the opening of the Memorial Library in 1953.

Due to the unorganized state of the department at the time, it was opened "without fanfare," Hagedorn recommending appropriate "advertising" once the collection was in good order. The duties of the curator were defined as follows: "75% cataloging materials and 25% searching for rare books now in the stacks, recommending purchases of rare books," and, 'in general, engaging in such work as will add to his professional equipment." Surprisingly enough, while this statement of duties implies other possible tasks, such as mounting exhibits, which Hagedorn did carry out, it leaves little room for servicing the collection for patrons. Hagedorn pointed this out in his *Annual Report* for 1949-50, adding that "the unsatisfactoriness of a one-man department is too apparent to need further discussion." In reading this report, one senses a general feeling of dissatisfaction. Although recommending purchases was considered one of his duties, *none* of the important reference works and rare books he recommended were purchased. Finally, he felt it necessary to state: "It is perhaps not unnecessary to point out that neither the article nor the address were prepared on library time." The article referred to appeared in the *Papers* of the Bibliographical Society of America and was entitled "Bibliotheca Thordarsonia: The Sequel"; the address was presented to the University's Language and Literature Club. Both these activities appear to be entirely appropriate and professional ones for a curator of rare books to perform and, in light of the extent to which the subsequent curator was involved in such activities, it may seem that Hagedorn had cause to be dissatisfied in his position.

Samuel A. Ives was appointed curator in 1950 and remained in that position until his sudden death on August 9, 1958. Ives was a classical scholar, with a knowledge of eight to ten languages in addition to Latin and Greek; an experienced rare book librarian; and a specialist in the history of science and the Bible.[21] Under his curatorship the department expanded services, developed effective relationships with the faculty, added greatly and significantly to the department, reorganized the collections, and refined procedures. Ives was active as an author of articles in scholarly journals, appeared on local television and radio programs, and initiated an important bibliographical project in the history of chemistry, medicine, and pharmacy.[22] Although he began as the only staff member in what was still a one-man and only partly-organized department, he was able to refer to what was to be his last full year as curator as "a banner year in the history of the RBD." As regards staff, the situation improved under Ives nearly to the point it was to reach at the end of the decade.

After Ives' death there was a hiatus of ca. 10 months in the occupancy of the curator's position. Handley, who carried on the day to day duties of the department referred to these months as a period of "treading water." During this same period members of other library departments did some work for the RBD. John Neu of the Order Department prepared a bibliography of the Burgess Collection (see *Collections Added* below) and Virginia Kay, also of the Order Department, organized the French Pamphlet Collection. Lloyd Griffin, the Humanities

Librarian, undertook the initial organization of the Sukov Collection.

The acquisition of the Little Magazine Collection of Dr. Marvin Sukov early in 1959 may have played no small role in the appointment of the next curator. Felix Pollak, who took over as Curator in the summer of 1959, was a poet and writer, who himself contributed to little magazines. After a career that included a doctorate of jurisprudence from the University of Vienna, and both bachelor's and master's degrees in library science, Pollak came to the Rare Book Department from Northwestern University, where he had been Curator of Special Collections. In addition to Latin and Greek, he knew German, French, and Italian. Although the staff of the department during Pollak's first year was as large as it had ever been, he, too, felt the need to request more staff in the form of permanent clerical help and/or an increased student assistant budget. Some help was again received from outside the department in 1959-60, as John Neu helped in the cataloging of the *Mazarinades* in the department.

In terms of staff the RBD thus evolved from a one-person department to one requiring a regular staff consisting of the curator, professional assistant to the curator, and student assistants performing the routine clerical duties in the department. This development was in part a response to that of the department in other areas, especially in collection development and public services.

Collection Development

In general a dual pattern in the acquisition of material for the RBD was followed during these years. Collections and individual works were purchased to build on the strength of the collection. For example, beginning with the Thordarson Collection's importance in the history of science, the Duveen, Boyle and Priestley Collections were added. Secondly, material was acquired outside of areas of present strength in response to faculty needs, major purchases not being made without faculty support or the expectation of such support. The Sukov Collection is an example of a major acquisition in a new area, but one which had received strong faculty support and which has been built on ever since. Acquisition by purchase specifically for the RBD was only one of several methods by which additions were made to the collections. Gifts, of both collections and individual titles, transfers from the general stacks, transfers from the State Historical Society Library, exchange books, and books acquired through normal channels and earmarked for the RBD all constituted means for increasing the department's holdings. Examples in each of the first four of these methods of acquisition illustrate the importance of multiple sources very well:

1. a) The gift from Norman Bassett of an O. Henry Collection of 20 volumes of first editions.
   b) The gift from Denis I. Duveen of manuscript notes of lectures in chemistry given by Joseph Black at the University of Edinburgh in 1776-77.
2. The transfer from the stacks of a volume of alchemical tracts once in the library of Isaac Newton and including marginal notes in Newton's hand.
3. The transfer from the State Historical Society Library of the exceedingly rare 47 volume lithographic facsimile of the quarto edition of the complete plays of Shakespeare.
4. Receipt on exchange from the University of Uppsala of Johannes Hesse's *Itinerarius* (Cologne, 1500).

General principles governing the material to be included in the RBD's collections had been set out in a document dated February 25, 1949 and supplemented by a note from Louis Kaplan, Associate Director, dated

March 25, 1949.[23] Now lost, this document must have contained chronological guidelines, since Hagedorn refers to selection of stack transfers "within date limits" in his *Annual Report* for 1948-49. Ives reported three years later that ordering by the curator was limited to rare books in the history of science and general bibliography.[24] Since this was still early in the department's history and before the expansion of fields of interest which was to come, it is possible that this policy changed later on. Books being recommended by the curator for transfer to the RBD either from the general stacks or by earlier transfer from the Historical Library underwent further review by Kaplan and Gerhard Naeseth, the Head of Technical Services.[25] In Pollak's first *Annual Report* (1959-60), he referred to what was the general policy governing RBD acquisitions, namely collecting "in strength" and reflecting faculty needs and interests.

Regarding this latter aspect of an acquisition policy for the RBD, Ives had solicited from 13 faculty members representing 9 departments names of titles that were rare and important in their fields, for the purpose of forming "a file of prime desiderata."[26]

This, however, was not the only instance of faculty-RBD contact which sheds light on the subject areas covered in the collections. At a meeting with several faculty members called by Louis Kaplan, the subject cataloging of rare books was discussed. The outcome of this meeting was a list of "Subject Headings for Rare Books" solicited from the faculty members present representing "the needs of people who would most use it."[27] This was intended to be a "subject guide" rather than a "subject catalogue." These headings were to be assigned by the RBD staff and a subject card file using these headings was eventually set up. While this is another example of faculty-RBD relations, it also provides a way of determining the strengths of the collection and interests of the faculty during this period. A printed list of these headings has not been located. A list reconstructed from the old subject-file in the department includes twenty-three headings:

Alchemy	Mathematics
Astronomy	Medicine
Biography	Music
Botany	Natural History
Botany-Herbals	Occult Science
Chemistry	Pharmacy
Cook Books	Philosophy
Emblem Books	Physics
Geography and Travel	Rhetoric
Geology and Mining	Sermons
Legal Works	Social Studies
Literary Works	

The following record of major collections added to the RBD during this period is based on information in the *Annual Reports* and articles in the *UW Library News,* the library's newsletter from 1956 to 1973. References to articles in *UW Library News* on the collections are given in parentheses at the end of each description.

Collections Added 1948-1960:

Thordarson Collection. 1949 (1946). *History of British Science, Color-Plate Books. Literature.* Acquired by purchase from the Thordarson estate for $300,000 in 1946. Originally 11,000 volumes; 4-5,000 volumes formed the nucleus of the Rare Book Department in 1949. (I:3, p. 4; XI-3, p. 1; see also Bay and Hagedorn)

Marshall (William S.) Collection. 1950-51. *English Literature and Travel.* Gift of the estate. Ca. 30 vols. of an original 700 from which the department could choose. (I:3, p. 3)

Brownell (George H.) Collection. 1950-51. *Mark Twain and Twainiana.* Gift of Brownell. Ca. 300 vols. and ephemera. (I:1, p. 2; II:9, p. 2; III:1, p. 7; XIII:7, p. 1)

Duveen (Denis I.) Collection. 1951. *Alchemy and Early Chemistry.* Acquired by purchase from H. P. Kraus for $50,000. 3452 vols., 2958 titles. One of the most extensive single collections of its kind. (II:1, p. 1; XII:3, p. 1; see also printed catalog *Bibliotheca Alchemica et Chemica,* London, 1949.)

Montauban Collection. 1952-53. *French Calvinism.* Acquired by the library in 1951. Of 982 books, pamphlets and manuscripts, 250 vols. selected for the RBD. (I:6, p. 1)

Russian Underground Collection. 1954-55. *Russian Revolutionary Movement, 1825-1925.* Acquired by purchase. 1,000-1,400 items. (VIII:6, p. 1)

Hoyer (Theodore) Collection. 1954-55. *Lutheran Theology, 16th-18th Centuries.* Gift of Theodore Hoyer to the library in 1918. Ca. 50 titles, (III:7, p. 1)

Slaughter (Moses S.) Collection. 1954-55. *Latin Classical Literature.* 48 titles.

Bassett (Norman) Collection. 1954-55. *Mark Twain and Twainiana.* Gift of Bassett. Ca. 70 vols. (See under Brownell Collect.)

Papyri Collection. 1957 (1920). *Egyptian Papyri, 3rd C. BC-7th C. AD.* Acquired in 1920 with funds given by a graduate student. 83 papyri. (II:8, p. 4; IX:10, p. 1; XII:7, p. 8)

Goldschmid (Edgar) Collection. 1957-58. Evolution of Anatomical Illustration. Acquired by purchase. 170 titles in 241 vols. Later transferred to the new Medical Library. (XII:9, p. 1)

Burgess Collection. 1957-58. *Thornton W. Burgess, Juvenile Author.* Gift of the estate of Roy Oppegard. 162 vols., 10 scrapbooks. (VI:1) p. 1)

Boyle Collection. 1958. *Robert Boyle, English Scientist.* Acquired by purchase. Originally collected by Hugh MacDonald Sinclair. 141 titles in 153 vols. Includes items not recorded in the standard bibliography of Boyle. (III:4, p. 1; X:4, p. 1)

Priestly Collection. 1958. *Joseph Priestley, English Scientist.* Acquired by purchase. Originally collected by Hugh MacDonald Sinclair. 134 titles in 147 vols. Includes items not in the standard bibliography of Priestley. (III:4, p. 1; X:5, p. 14)

French Pamphlet Collection. 1958. *Political Pamphlets, 1550-1650.* Acquired by purchase. Ca. 1,000 items.

O. Henry Collection. 1958. *O. Henry and Porteriana.* Gift of Norman Bassett. 20 vols. (III:5, p. 1)

Wallerstein (Ruth C.) Collection. 1958. *English Literature, 17th C. Imprints.* Gifts of her estate. More than 60 vols. of the original 1,400 given the library are in the RBD. (III:6, p. 1)

Mazarinade Collection. 1958. *Opposition to Cardinal Mazarin, 1648-1652.* Acquired by purchase in several small collections. Several hundred. (XIII:2, p. 1)

Sukov (Marvin A.) Collection. 1959. *Little Magazines, 1900-1960.* Acquired by purchase from Dr. Marvin A. Sukov. More than 700 titles and 10,000 issues. One of the most extensive collections of its kind. (IV: 3, p. 1; X:2, p. 6; XI:5, p. 1; XII:1, p. 16)

Chwaliobog (Witold) Collection. 1959-60. *European Theology, 17th and 18th Centuries.* Originally acquired as a permanent loan from the Kellogg Public Library of Green Bay in 1946. Ca. 1,000 vols.; partly in RBD. (IV:10, p. 1)

Beatty (Arthur) Collection. 1960. *Wordsworthiana.* Gift of Hamilton Beatty in honor of Prof. Arthur Beatty. Originally more than 1,000 vols.; the editions of Wordsworth and the Wordsworthiana housed in the RBD. (V:2, p. 4; see also printed exhibit catalog)

Notes

[1] Memorandum re: Thordarson Library [incl. "Excerpt from Minutes of Regents Meeting, January 19, 1946"] no date, University Archives, UW-Madison.

[2] E. B. Fred, *Edwin Broun Fred: an interview* conducted by Donna S. Taylor, Madison, Uni-

versity Archives Oral History Project, 1976, p. 87.

[3] The library has been described in articles in the *Papers* of the Bibliographical Society of America by Jens Christian Bay ([1930] *23*:1-17) and Ralph Hagedorn ([1950] *44*:1-26). Thordarson's biography appeared in Reykjavik in 1973 (Steingrimur Jonsson, *Hugvitsma durinn Hjörtur Thordarson.*)

[4] Chester Thordarson, Letter to President Clarence Dykstra, December 11, 1943, University Archives, UW-Madison.

[5] Gilbert H. Doane, Letter to Clarence A. Dykstra, April 18, 1942, Rare Book Department Files, UW-Madison.

[6] A. W. Peterson, Letter to President Clarence A. Dykstra, May 16, 1942, RBD Files, UW-Madison.

[7] Draft, unsigned, includes a pencilled note indicating it was submitted to President Dykstra, November 18, 1943, RBD Files, UW-Madison.

[8] A. W. Peterson, Confidential Report to President Fred re Thordarson Library, July 6, 1945, RBD Files, UW-Madison.

[9] Chester Thordarson, *op. cit.*

[10] William S. Marshall, Letter to Gilbert Doane, May 15, 1945, RBD Files, UW-Madison.

[11] _____, Letter to Gilbert Doane, May 30, 1945, RBD Files, UW-Madison.

[12] Confidential Memo re Thordarson Library, November 15, 1945, RBD Files, UW-Madison.

[13] Gilbert H. Doane, Letter to Jens Christian Bay, November 24, 1945, RBD Files, UW-Madison.

[14] Confidential Memo re Thordarson Library, November 27, 1945, ms., RBD Files, UW-Madison.

[15] F. J. Sensenbrenner, Letter to D. C. Everest, December 3, 1945, RBD Files, UW-Madison.

[16] Memorandum re: Thordarson Library, no date, University Archives.

[17] Gilbert H. Doane, Letter to Jens Christian Bay, February 1, 1946 RBD Files, UW-Madison.

[18] Ralph Hagedorn, "Bibliotheca Thordarsoniana: The Sequel," *Papers* of the Bibliographical Society of America, *44* (1950), p. 4 and 3, resp. For detailed description, see also Jens Christian Bay, *op. cit.*

[19] *Annual Report* of the Rare Book Department, UW-Madison, 1948-49, 1949-50 and 1950-51.—Most of the information for this section on staff has been taken from the Annual Reports for the appropriate years. Information from other sources only will be noted separately hereafter.

[20] Jeremiah O'Mara was forced to resign after only one week's service after having been stabbed on Bascom Hill on June 24, 1956. *UW Library News 1*:2 (July/August 1956), p. 13.

[21] "Samuel A. Ives," *UW Library News* (Sept. 1958), p. 1-2.

[22] *Chemical, Medical and Pharmaceutical Books Printed before 1800: in the Collections of the University of Wisconsin Libraries*, edited by John Neu, compiled by Samuel Ives, Reese Jenkins, and John Neu, Madison, University of Wisconsin Press, 1965, p. vii.

[23] *Annual Report 1948-49,* RBD Files, UW-Madison.

[24] *Annual Report 1951-52.*

[25] *Annual Report 1953-54.*

[26] RBD Files, UW-Madison.

[27] *Annual Report 1954-55.*

THE WELFARE MUSE

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John Steuart Curry was the first permanent artist in residence at University of Wisconsin—Madison. The post was attached to the School of Agriculture. This progressive institution believed in introducing the latest technology into farming as well as in giving cultural expression to the values of this emerging educated class.[1] Curry's family was an American version of landed gentry. They were spared the trauma of the Depression, which might help to explain the artist's own romantic digression from the period. Curry attained prominence as a member of the midwestern Regionalist movement with the more widely known Thomas H. Benton and Grant Wood. This paper is a study of the values expressed in Curry's work, within the context of New Deal art, and was suggested by recent exhibits of his work.

The word welfare in the title recalls the fact that most 1930's artists like the other unemployed of the era, had to take a poverty oath and be officially on the dole before becoming eligible for work assignments.

The muse was the Great Depression itself. The disastrous economic climate with its social suffering and a budding trade unionism movement proved to be a fertile source of artistic images, the so called American Scene. Sometimes it was handled directly, as in the case of the social realists, or indirectly in an equally derivative but retrospective flight from its immediacy as in the midwestern Regionalist work of John Steuart Curry.

THE ECONOMIC BACKGROUND

Because of its unprecedented scale of subsidized artistic productivity and the polemics over style, subject and message which I will introduce shortly, the Depression resulted in several revolutionary steps.

It brought about official recognition of art as a legitimate occupation worthy of "unemployment benefits." It resulted in the toppling of academic art's monopoly and opened the field to newer forms of expression in the art commissioned for government buildings.[2] And, the Depression introduced novel concepts such as 'Art on Wheels'—mobile art museums, and adult art education networks as well as other methods of disseminating art to the masses.

Government patronage of the arts had its genesis in the contact initiated in 1933 by artist George Biddle with President Roosevelt. Biddle pleaded on behalf of fellow artists for an opportunity for American artists to immortalize in permanent art form and make living monuments to the: "social revolution that our country and civilization are going through . . . and to the social ideals which you are struggling to achieve."[3] Biddle cited the Mexican muralists as the precedent that they would like to follow. Roosevelt replied that he did not want a lot of young enthusiasts painting Lenin's head on the Justice Building.[4] He steered Biddle to the Secretary of the Treasury Department, Morgenthau, who set up the internal Section of Painting and Sculpture in 1934.

In a milieu of cyclical repression and revolution, Mexican artists used murals as a form of social protest.[5] The art form was indigenous to the illiterate, agrarian people. The American murals of the 1930's lack this immediacy and the medium itself has been abandoned for all but decorative—architectural purposes.

The other major New Deal art program, and the major benefactor of the multitudes of artists, was the Works Progress Administration (WPA), more specifically the Federal Art Project (FAP), established in 1935. The purpose of mass patronage was to keep artists alive and creative during this difficult period by purchasing their work while practicing non-interference with the artistic process. Both forms of patronage wound down with the onset of World War II.

The Section referred to above had a definite stated program of cultivating native art and artists while acquiring suitable art, as long as it was American Scene. In their attempt to assist development of art in this country administrators proscribed potentially divisive subjects. One of these was Curry's *Freeing of the Slaves.* Curry described what happened: "because of the racial implications of the subject matter it was felt that Washington was not the appropriate place to erect this mural."[6] Censorship was felt by artists on the other side of the political-artistic spectrum as well. The social realist Ben Shawn had to erase from a mural a Walt Whitman inscription perceived as too secular.[7]

The whole patronage phenomenon was a conscious attempt by the government to encourage a taste for a particular style of American art and thus engage in a management of ideas through the marketing of a controlled public art.[8] This manipulation was implemented by the public endorsement of a chosen style and subject matter, prominent display in places such as post offices and the precaution that the art said the right thing including tacitly encouraging the re-painting of much of American history where necessary.

To illustrate this point we can note that Curry's *Justice Defeating Mob Violence,* 1937, stands in the Justice Department building in the space originally reserved for the *Freeing of the Slaves.* This mural depicts a white man being protected from a lynch mob, clearly a victim substitution. In the other Curry works on the theme of lynching, the victims are black. A companion piece in the Justice Building is *Westward Migrations,* 1936, which shows noble American pioneers pushing ahead with an absence of any native Americans in their way.

The concern to spur American economic recovery by buying American and bolstering "America's faith in itself" is not a sufficient explanation of why the emerging American art took its particular regional style. After all, the private art patrons and the government could have had no reservations about buying and promoting the non-representational native art which was evolving in parallel to the realism of the 1930's.

I am, of course suggesting an accomplice role for the Regionalists in the government policy. To the extent that Curry engaged in collaborating with the party line to the detriment of art itself or the endeavors of other artists, he is culpable. A post-mortem on the careers of Curry, Wood, and Benton reveals a cul-de-sac. They failed to influence the further development of American art or its international standing. This is ironic because they spearheaded the call to arms for the creation of a native American art in opposition to modern European trends, a convulsive reaction to the New York Armory Show in 1913.

Regionalist Ideology

The Regionalists attempted to nationalize an art which spoke to their idea of middle America. According to the group ideologue Benton "the intellectual aspects of art are not art."[9] The critic Thomas Craven wrote: "the function of art is communication and not technique."[10] Curry's own criticism of social realists was that they painted symbolic figures rather than real people engaged in real events.[11] The obvious retort one can make to Curry is that a painting is nothing if not a symbol.

Perhaps the figures of the social realists

seemed symbolic to Curry precisely because they were not farmers. This is Curry's own self-characterization: "I do not feel that I portray the class struggle, but I do try to depict the American farmer's incessant struggle against the forces of nature."[12] Curry as an artist poses a strange contradiction. He is trying to give an agrarian underpinning to an industrial society. A farm is a farm, in Europe or America, the nostalgia of the western frontier aside. An art which denies the existence of 90% of America, is a type of violence and not a unique, new style of American art. There is no such thing as an American people. The gates of immigration are still open, and they were open then too.

From biographical materials one gathers that the Regionalists spent time in Europe, but got no first hand exposure to the modern movements, with the exception of Benton. Instead, they floated like ghosts through the museums in search of dead masters. They made no attempt to plug into the vitality that was there but treated it as a place full of cemeteries. Is it any wonder that 'resentiment' was their reaction when these Europeans began to influence and control the course of modern art?

Perhaps only the itinerant photographers that worked for the Department of Agriculture give a direct access to the raw, uninterpreted human mass of the Depression, because they found it harder to superimpose a veneer on the images they took in the field. While it is known that few social realists had proletarian roots and, therefore, their insight and accuracy of portrayal of the working class are somewhat suspect, they at least acknowledged that they lacked a universal, ready idiom.[13] As a result, their work evolved more individualistically than that of the Regionalists.[14]

In contrast, the Regionalists in effect if not in intent, produced an art for hard times, an art encouraging the lowering of expectations and defusing the impulse toward the revolutionary. Instead of wondering what this new American art would be and who would produce it and when, the Regionalists decided that they already had it. They treated America as already-made and engaged in an aesthetics of everyday life and banality, with official sanction. The artistic commitment of the Regionalist movement was an attempt to create a landed gentry.

It is ironic that Curry, basically a nature artist, Wood, whose Iowa landscapes are very private and introspective visions, and Benton, all got drafted into expressing the official American consciousness with only the tenuous bonds of surface 'realism' and midwestern themes to bind them. Of the three, perhaps only Benton rose to the task with his muscular man as machine compositions unifying the farm and the urban setting.[15]

The fallacy of the Regionalist ideology is the belief that realism and familiarity somehow preserve and present an intact world with its verities and homilies. Curry forgets that the simplest object can be removed from its context in the universe through art. His focusing on ordinary life, despite his motives, takes the farm out of its specific social context. Using his father as a subject may avoid symbolism and intellectualization for Curry, but not for his audience. He is a child denying that there is a world outside of Kansas. And Curry does not try hard enough to reintroduce reality even within this limited subject matter.

The major political connection to make between the subsidized art produced by the Regionalists and their sponsor, was that the "paid commercial message" dictated that the way to survive in the face of an overpowering force such as the Depression is through resignation and perseverance. You should hold on to your traditional values and find a way to graze off the land. Where the political order manages to present itself as the natural order, people transfer the attributes of nature to the political order

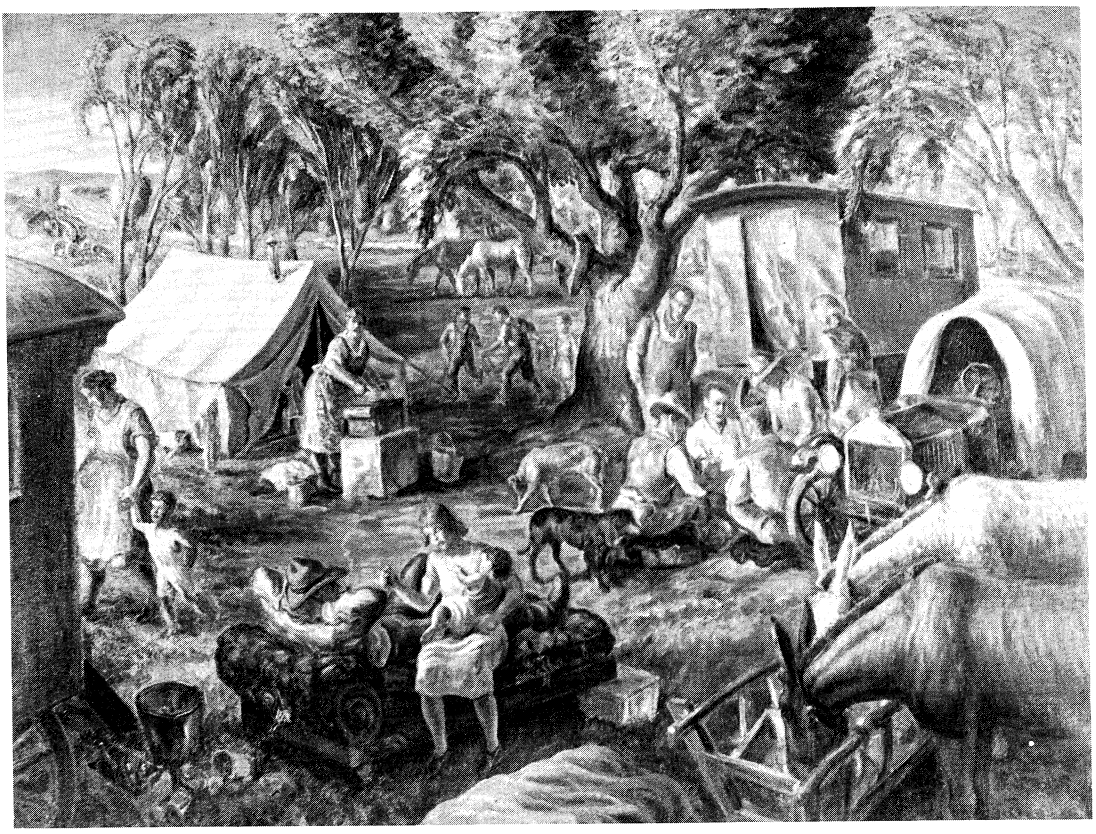

Fig. 1. John Steuart Curry, *The Road Mender's Camp* 1929.

itself, leading to totalitarianism and glorification of the common man and a rise of 'resentiment' in the face of difference.

Curry's Work

Now to come to Curry as the man in his work. I find much of his work somnabulistic in flavor, curiously static even when portraying catastrophes. His focus is the anticlimax. This is his individual trait. In the *Road Mender's Camp,* 1929, (Fig. 1) all is in its place, there is no discord, just people at rest after a hard day's work. The key here is that he chose not to show the work itself—turning instead to the card playing, children's games and the mother with babe in arms.

Consider his *Baptism in Kansas,* 1928. Its history includes the fact that the canvas started out as Signorelli nudes around a bathing pool and then the prop change took place to a wooden baptismal fount.[16] This suggests Curry was still in search of subject matter. There is circus imagery here which relates to his later opus of circus prints. It is a spectacle complete with center ring, a Ferris wheel suggested by the omnipresent weather vane, and an absorbed audience. There is a cohesion of the group, suggesting unity of purpose, but Curry gives us an unobstructed access to center stage on the left as if offering us an invitation to join in or perhaps an outlet to escape.

The hands of the two protagonists are highly symbolized. Curry consistently uses hands iconically, they express a lot in a very stylized manner. The birds overhead are emblematic of the spirit. For example, in

The Fugitive, 1933, there are butterflies symbolizing flight. The woman in white in *Baptism* is suggestive of a melting candle, she dissolves and is assimilated into the glimmering pool of white water. The preacher pushing her in is shut-eyed and forcibly concentrating, face and body turned slightly away from her with effort. Also, you can see the Curry technique of using the weather metaphor to represent human emotion. Here we have a sunny day, but the emotional pitch of the group is evoked by the tight sway of the human circle. We are inside a human tornado. This is the work that launched Curry nationally, having won him a competition. I am not suggesting a mercenary response in Curry, but his subsequent work does engage in further nostalgia and glorification of his own idyllic version of an atemporal America.

When I look at *The Tragic Prelude* (John Brown), 1938-39, and see the background wagon trail, I wonder whether we should see it as the frontier spirit or flight from reality? Brown is an imposing quixotic figure, with a Bible, a gun, and a brave daring stance. He is simultaneously defiant and vulnerable with torso extended wide, a figure of obvious historical impact. The Bible and the gun symbolize the inherent injustice and accommodation to hypocrisy America has to take in order to exploit the blacks. Had we taken the Bible literally, and Curry is very interested in the impact of religion, there would not have been a need for the gun and the bloodshed. In the mural there is an obliviousness to Brown except by the black faces gazing up at him. The emerging black imagery in Curry and others in the 30's served as the symbol of social and not merely racial oppression. They had a group exhibition on the subject of lynching called "An Art Commentary on Lynching" in 1933.

Interestingly enough, we can accuse Curry of whitewashing Brown. The problem, as I see it, is that John Brown is not finished yet, although dead. He is still, and was then, a dynamic figure. The black struggle is still going on. The government showed awareness by not permitting black subject matter into Washington. This mural of a less than favorite adopted son is in Topeka, Kansas. This placement, although geographically accurate, limits the national importance of its theme. How could John Brown be a hero in a country which feared him and is still racist and ambivalent about its heroes? Curry is trying to fence Brown in, to homogenize him so to speak by tucking him away into the pages of history.

The Tragic Prelude, although visually exciting, points out that Curry was a product of his society. We have to deny privileged access to one's own values to all, even artists. No one escapes the shadow of history. One finds other hints of criticism of the social order in Curry, but one wonders why they are only hints and why he found a superficial, token treatment of blacks more accessible than dealing with the American worker, or the dustbowl and migrant labor.

If you look at the black faces in the mural you see them cowering, terrified in the protective shadow of the good white man, and the abolitionist sentiment he represented. So a final objection is that the blacks have been dispossessed of even their anger and the potential for violence and revenge. There are no angry black people, just an angry John Brown.

Freeing of the Slaves, 1942, is the infamous mural banned from the Justice Building. It portrays blacks in the aftermath of *The Tragic Prelude.* The center figure of Brown has been replaced by the young black who has stepped off his tree-cross in *The Fugitive,* and is now leading his people in exultation. The union flag is center stage and you can almost hear the voices, the black chorus praising the Lord. An old man is still praying in the wagon, perhaps he does not realize yet that salvation is here. Unlike the flat terrain in the back of John Brown, these people are ascending from the darkness left behind. They emerge from a hollow, dark low horizon on the left and are teeming into

the light center stage. In a similar mural, Diego Rivera's *Zapata,* Zapata's men are armed, the people and the liberators are one and the same. There is no dichotomy as in American history and imagination. The casualties at the Mexican revolutionaries' feet are the ones they have killed themselves.

The forces that caused the plight of blacks were human forces: racial prejudice, economics, religion and politics. In the flood theme of *The Mississipppi,* 1935, they are represented as impersonal, uncontrollable forces of nature, blacks caught in the turbulent waters of history. Again we encounter the weather metaphor for human existence. This removes the human element of guilt and the personal value of survival as well. The blacks are just 'lucky' to have survived the whole mess. And what follows is that it all just could not be helped. The victims are resigned in the painting and resorting to prayer. The political order is the natural order with its storms and its calm days so do not rock the boat. Things will get better in time.

Only the roof of a house is left where the whole black family remains intact, even the cat. They are set drifting into a new future, freshly baptized as Americans. Curry gives blacks turbulent waters while the whites immerse themselves in calm streams and pools. The supplicating hands of the male are pronounced, males are the more expressive gender in Curry's work.

The one nice quality about *The Mississippi* is its musical-aural quality. The tumultuous waters, soaked whistling trees, cat meowing, roof planks creaking and the howling wind, all combine to produce a wall of sound effect.

Wisconsin Landscape, 1939-39 (Fig. 2), is representative of the later landscape work and is a macrocosm to the microcosm seen in the close up of a *Kansas Cornfield,* 1933. It is unusual in that it is very dramatic in its high color and almost impressionistic brush quality. The chiaroscuro light strips crisscross the landscape into dynamic parcels. The raised perspective also magnifies the already present vastness of the subject. If the human houses and barns were not tightly delineated by the artist, one could forget the intrusion of man into this Eden. The drama of nature occurs without human intercession. Perhaps, while awed by the suggested beauty of it we are also supposed to feel

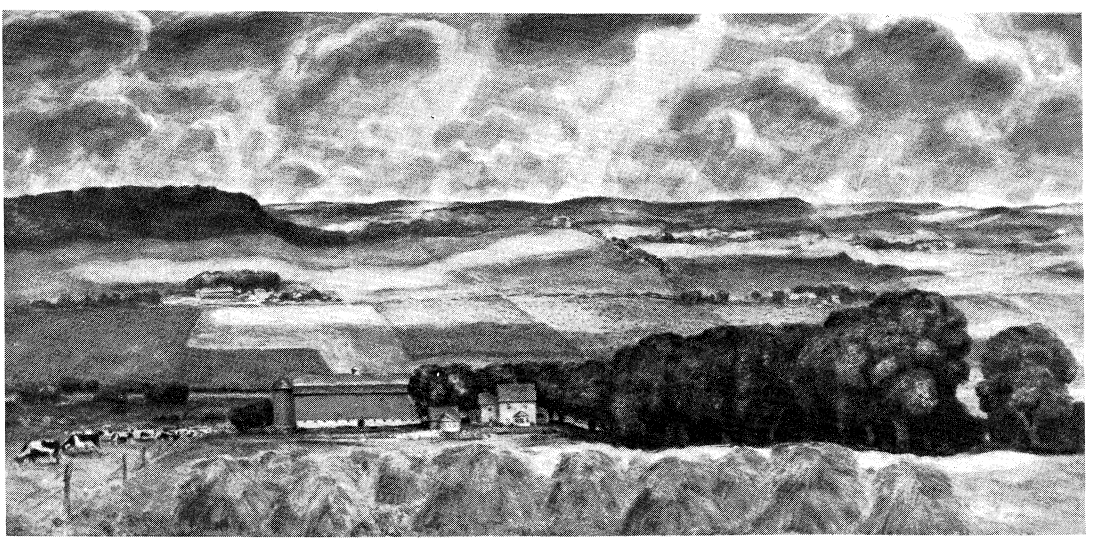

Fig. 2. John Steuart Curry, *Wisconsin Landscape* 1938-39.

fatalistically that everything would be fine in the absence of humanity.

Curry's nature images recall Nietzsche's indictment of society as being no shepherd and one herd. But this painting is certainly a more emotional engagement on Curry's part than the flat landscape backdrops he erects in the historical murals.

In closing this section, I would like to quote Arthur Dove, an abstractionist in the 1930's. "When a man paints the El (subway), a 1749 house or a miner's shack, he is likely to be called by his critics 'American.' These things may be in America, but it is what is in the artist that counts. What do we call American outside of painting? Inventiveness, restlessness, speed, change. . . . A painter may put all these qualities in a still life or an abstraction, and be going more native than another who sits quietly copying a skyscraper.[17] Only the term 'copying' betrays the indignation in this otherwise lucid pronouncement on the polemics of realism versus abstract art in America.

What Price Art?

The Section was oppressive in their funding of public art, attempting the creation of art for the masses. The older non-democratic societies had sponsored art for the elite only. The WPA was benevolent and non-intrusive into the creative process, but financially less rewarding than the Section. A question we might ask in retrospect is whether the public could have refused something the artist produced. Fortunately, we had the Section to insure that our dollars were well spent.

In post World War II America, there have been three ways for the artist to exist: in the commercial market, via subsidies through grants and awards, and teaching in the academe, while retaining the energy and impetus to produce. The days of private patronage seem to be over. One problem with public funding is that during periods of economic stress, art takes low priority and loses funds proportionately. Another problem is that centralized disbursement of funds and judging of beneficiaries, may lead to subsidizing mass culture art.[18] Also, government bureaucrats have a fondness for the concretism of conspicuous consumption evidenced in the erection of monumental museums and theater complexes.

A sad postscript to the New Deal was the destruction of a vast amount of art. Most of the destruction was not malicious and, before the dissolution of WPA, strenuous attempts were made to house and permanently allocate art works with any public institution that would have them. The WPA anticipated that the war shortages and the prospect of indefinite storage would imperil the works. This danger materialized when the majority of the work fell under the classification of surplus art.[19] There are stories of prints being recycled into pulp, paintings sold as 'used canvas,' and sculpture demolished because of its sheer size.

Of course, there are villians as well, such as the infamous Lt. Somervell who interpreted the order to liquidate the WPA as a mandate to destoy its artistic legacies as well. He destroyed several mural panels at Floyd Bennett Airport in 1940 as subversive material. But Somervell did not go after communist iconography alone. About 800 paintings and graphic works were incinerated. In the words of an artist active during the era: "for many artists several years of their serious professional work had simply evaporated."[20] The problem is compounded by the fact that the allocation cards have been lost thereby making the location of surviving lesser known work impossible to trace. Art had finally become public property.[21]

Notes

[1] Laurence E. Schmeckebier, *John Steuart Curry's Pageant of America*, (New York: American Artists Group, 1943), 82.

[2] Francis V. O'Connor, *Federal Support for the Visual Arts: The New Deal and Now* (Greenwich, Connecticut: New York Graphic Society, Ltd., 1969), 106.

[3] Ibid. 18.

[4] Ibid.

[5] Ralph E. Shikes, *The Indignant Eye* (Boston: Beacon Press, 1969), 374.

[6] Matthew Baigell, *The American Scene: American Painting in the 1930's* (New York: Praeger, 1974), 129.

[7] O'Connor, 24.

[8] Olin Dows, "The New Deal's Treasury Art Program: A Memoir," *The New Deal Art Projects, An Anthology of Memoirs*, edit. Francis V. O'Connor, (Washington, D.C.: Smithsonian Institution Press, 1972), 36.

[9] O'Connor, *Federal Support,* 63.

[10] Ibid. 23.

[11] Joseph S. Czestochowski, *John Steuart Curry and Grant Wood, A Portrait of Rural America* (Columbia, Missouri: University of Missouri Press, 1981), 40.

[12] Baigell, 128.

[13] Ibid. 174-175.

[14] Prior to the Depression America had no artistic tradition of social commentary and protest except political cartoons in the print media.

[15] Martin Greif, *Depression Modern* (New York: Universe Books, 1975), 34-36. Offers a quote by designer W. D. Teague, which applies to the Benton dynamics. "We are a primitive age, a dynamic people, and we respond only to the expressions of tension, of vigor, of energy."

[16] Oliver W. Larkin, *Art and Life in America* (New York: Holt, Rinehart, and Winston Inc., 1949), 414.

[17] O'Connor, *Federal Support,* 66.

[18] For an exhaustive exploration of these issues see Gifford Phillips, *The Arts in a Democratic Society* (Santa Barbara, California: The Center for the Study of Democratic Institutions, 1966).

[19] O'Connor, *Federal Support,* 102.

[20] Ibid. 103.

[21] Research funded in part by a Wisconsin Humanities Committee Mini-Grant.

SOME REFLECTIONS ON RIGHTS: HUMAN, NATURAL, MORAL, AND FUNDAMENTAL*

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Recent years have seen an unprecedented flurry of interest in the philosophical analysis and elucidation of human rights. There are now two or three journals devoted to human rights—or at least to their discussion. The 1981 volume of *Nomos,* no. XXIII, is on the topic of Human Rights. There have been many books on the subject with, we may be sure, many more to come. It is a famous observation of Hegel's that The Owl of Minerva spreads its wings only with the coming of the dusk. We may hope that this observation, so profound on other matters, does not prove to be true of human rights as well. But there are regimes in the world that honor human rights more in the breach and the official rhetoric than in the observance, and others where they are honored in no way, not even in the official ideology. Even the present tendency of public opinion seems more concerned with freedom of enterprise than freedom of the person, with property rights, to lapse into some older terminology, than human rights. I think it was Anatole France who observed that a poor person has as much right as a rich one to dine at the Ritz, or to sleep on the banks of the Seine, or something to that effect, and a political regime in which that is emphasized is not one that has any special concern for human rights. Yet the notion is alive in the world, if not at the moment in Washington, and it behooves us to understand why and how.

The interest generated in recent years by appeals to human rights is not something temporary, unless human life itself is. That the appeal to human rights has met with such a response in the less developed parts of the world, as well as those enslaved by the present day imitators of Nero and Caligula, indicates that it is not something that can easily be papered over. On the world stage, the appeal to human rights has always had a revolutionary force, from the time it first arose in the 17th century, and though the force of the appeal has waxed and waned, it seems always ready to be revived when the occasion warrants.

The present period in human history may be one of those occasions. It is to be hoped that the present interest taken by philosophers in the concept does not result in its being appropriated as a topic to be endlessly analyzed and argued about and refined to the point where its appeal to governments and ordinary people is correspondingly diminished. Too much philosophical exploration of and debate about minutiae may tend to have this effect. Still, we need not worry overmuch about this. For it is not evident that all the philosophical talk about the existence of God has had any appreciable effect on the strength of religious belief. So it may be that all the philosophical talk about human rights will not damage the concept as a political, moral, rhetorical, and emotional tool. For of course it is such a tool. To be sure, on many occasions it has been misused. The idea, naturally, is to

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clarify the concept, not to bury it; to elucidate it, not to appropriate it, and if philosophy performs its proper task aright, it will be strengthened, not diminished.

That is my object in this paper. I present no theory of rights—there are plenty of those available—only some observations and reflections and questions that seem illuminating and essential for any adequate general theory of rights to take account of.

1. A theory of rights must capture and explain the force of "rights-talk." It has rhetorical hence political and also moral force, which must be recognized. It is a vital weapon of social conflict, hence must be understood. It has a nearly universal appeal, hence must be mastered—not for purposes of propaganda, but for purposes of understanding and securing rights, when genuine.

For rights-talk is significant. The claim "A has a right to X" is different from "A wants X." If I say "I have a right to do X" that is different from saying "I want to do X." When we use such locutions ourselves we are conscious of meaning something different and something more and when we hear them used by others we are conscious of their meaning something different and something more. What the difference is, it is the task of a theory of rights to determine, but the fact is plain enough. The fact that one who asserts a right to something also wants that thing does not deny the point of difference; it only accentuates it. But I must recognize that when someone else asserts a right to something, what is being asserted is, quite apart from the validity of the claim, essentially different from merely asserting a desire to have it or demanding it, because I recognize that that is true of myself when I assert or claim a right. I am aware that I am not merely expressing a desire; that I don't merely *want* it. This is true even if I on occasion engage in deception, and assert a right to something that I only want and do not really believe I have a right to.

The argument here is something like Santayana's for the reality of truth. One awakes "to the being of truth," Santayana observes, through "the experience of other people lying. When I am falsely accused, or when I am represented as thinking what I do not think, I rebel against that contradiction to my evident self-knowledge; and as the other man asserts that the liar is myself, and a third person might very well entertain that hypothesis and decide against me, I learn that a report may fly in the face of the facts. . . ." [*Skepticism and Animal Faith* (1923), p. 266.]

Since I am aware that I mean something different when I assert a right to something than when I merely say I want it, I must recognize that there is a difference between them, even if I am unable to describe that difference in words. And a little experience of the world is sufficient to convince me that others also are aware of such a difference.

Further, there is a force in "You have no right to do that" that is not captured by its formal equivalent, "It is wrong of you to do that," or "You have a duty not to do that." What is the explanation of this?

To have a right is to have an authorization, an entitlement, and this is a certain sort of moral capacity. "You have no right" claims that you do not have that capacity. But why does it have this force?

2. Yet rights-talk is easily and often exaggerated, and is often used to cover up and suggest a sanction for mere claims or demands that have no other backing than self-assertion. In these circumstance, "I have a right to it" is only a highly emotive way of saying "I want it." Thus people claim a right to something they want *because* rights-talk is in general significant, powerful, effective. Too much of this darkens counsel, tends to corrupt moral discourse at its roots.

By an analogue of Gresham's Law, bad rights-talk will tend to drive good rights-talk out of circulation, or rather it will tend to corrupt and discredit it, as inflation corrupts

and discredits a currency. This is why rights-talk, and rights-claims, need to be so carefully scrutinized, like the claims of advertisers and hucksters and propagandists.

Just as there is a distinction between a claim to know and genuinely knowing, there is a distinction between claiming to have a right and genuinely having one. Those who claim a right to everything they want are making a claim that would be self-contradictory if universalized. It follows that no one can have a right to everything he or she wants. The distinction between wanting something and having a right to it remains basic, and enables us to say that in a morally tolerable world people will, in general, have rights to have their basic wants satisfied and that these rights will be recognized. But since not everyone can have a right to everything she or he wants, *no one* can—and no one does.

3. In the United States especially there is a tendency to use rights-talk extravagantly, to exaggerate one's special wishes or wants into the claim that one has a right. This is only partly because of the American tradition of the tall tale and the happy exaggeration. The country was explicitly founded on the basis of rights and in the light of the philosophy of natural rights and the enlightenment, and the tendency to think in terms of rights as basic and self-certifying reasons is part of our heritage, which we acquire as we acquire our mother tongue. One result of this is that opposing sides in moral conflicts assert incompatible rights and as the conflict escalates assert them in louder and louder tones, so that many moral and value conflicts tend to turn into shouting matches, or worse. Some of these conflicts we get over; some we do not. But if the concept and the language of rights is to be of use in settling conflicts we must have a way of resolving conflicting claims of rights. It may seem self-evident—though it is probably not even true—that genuine rights themselves cannot be in conflict. But it does not matter, for a conflict of rights-claims cannot be settled merely by an appeal to rights. There must be a basis for determining which claims are genuine and which not.

4. Some consideration of the history of the concept may be of use. I do not know for certain when the expression "*human* rights" came into general use and currency, but the evidence indicates that it came into general use in the late 19th Century or early 20th, as part of the progressive movement. It was used in contrast with *property rights*, and it involved the implicit claim that human rights should take priority over the rights of property or corporations. Thus it was used by supporters of Woodrow Wilson's "new freedom" and in conjunction with Theodore Roosevelt's "square deal," and perhaps earlier. This is not its standard use now, but this is its pedigree. As the term is used now it traces from the 17th century notion of *natural* rights, which were regarded as the natural rights of man (as in Tom Paine's famous book). Mary Wollstonecraft's *Vindication of the Rights of Woman* received no noticeable vindication at the time it first appeared (1792, the year after Paine's), but it has been vindicated now for some time, so it is probably better to speak of the rights of human beings than of the rights of man. Hence "human rights" has a birthright. But it is, I think, a not altogether felicitous expression.

Why "human rights?" Presumably because they are the rights human beings have in virtue of being human, and they are no other special class of rights. The expression suggests, however, that they are a special kind of rights, along with such categories of rights as constitutional rights, civil rights, political rights, economic rights, legal rights. Of course they are not. And why are these rights of human beings, and not of other creatures or beings as well? I would prefer to speak of *moral* rights, but of course it is futile to argue against an established usage. Better to understand it.

But even though human rights are in a way a descendant of, and another expression for, natural rights, they are also a bit different. They are similar in that they claim to be universal, to have validity across cultural and political boundaries, to be the rights of human beings as human beings, in virtue of their common humanity (an assumption necessarily involved in the conception). But natural rights, as the concept was used for generations, were thought of as rights to certain kinds of freedoms and protections. What are now referred to as human rights tend to be thought of as, perhaps in addition, rights to certain kinds of services and benefits, such as health care and a living wage. Is this significant? I think it is not, that it is only a historical accident, the term "natural" having fallen out of favor and the term "human" not—at least not yet.

One rather amusing and at the same time pathetic aspect of this usage is the appearance of signs and manifestos saying, "We have human rights too!" This is usually proclaimed by some group that feels particularly oppressed, and of course sometimes such a group genuinely is oppressed. But this involves a confusion of categories. What is meant is "We are human beings and we have rights too." Unhappily, it is sometimes in this unhappy world necessary to point that out. But the expression "We have human rights too" suggests, as I said before, that human rights are a certain *kind* of rights, and of course they are not. They are the rights natural to human beings, if they are genuinely rights at all, in virtue of certain invariant and fundamental moral principles. Since their justification must lie in such principles I think it more perspicuous to think of them as *moral* rights.

And we should remember, in speaking of human rights, that we should not overlook human wrongs. Though it may not be only human beings that have rights, it is only human beings who can commit wrongs, just as it is human beings who are the source of evil, and it is only human beings who can violate human rights.

5. What is the basic human right, assuming that there is one? One often hears it said nowadays that the basic human right is the right to life, on the ground that being alive is essential to having any other rights. But the argument is fallacious. What is essential to having rights is not the *right* to life, but simply life. A right to life is, I have come to think, an ad hoc construction used to shore up certain contentious positions based on faulty logic and a misreading of history.

The idea that the right to life is basic is often traced back to the Declaration of Independence, in accordance with the characteristically American practice of tracing any contentious point of political philosophy back to some great document in the history of the country. Now it is true that the Declaration of Independence, as adopted, contains the phrase: "that all men are created equal, that they are endowed by their creator with certain unalienable rights, that among these are life, liberty, and the pursuit of happiness." But a little research suffices to show that what appears in the final version as a right to life was stated in Jefferson's original draft and early versions, and retained for more than a little time, as a right to "the *preservation* of life, and liberty, and the pursuit of happiness." [See Carl Becker, *The Declaration of Independence* (1922), Ch. 4.] A small change, you think? Well, I am not so sure it is so small. I think it was not a philosophical consideration that led to the dropping of "the preservation," but considerations of style and rhetoric and politics. For the purpose, superb. For philosophical and even moral purposes, perhaps not so happy.

Consider its antecedents. Hobbes's "right of nature . . . is the liberty each man hath, to use his own power, as he will himself, for the preservation of his own nature; that is to say, of his own life . . ." [*Leviathan* (1651), ch. 14, par. 1]. Locke, a more obvious

influence on Jefferson, also had put it this way, though this is almost always overlooked in quick and rapid statements of what are taken to be Locke's basic principles. We find Locke, in the *Second Treatise of Government* (1690) speaking (sec. 11) of the "right of self-preservation" and also saying: "Natural reason . . . tells us that men, *being once born,* have a right to their preservation, and consequently to meat and drink and such other things as nature affords for their subsistence" (sec. 25, italics added). I do not know why Locke restricted himself to "men, *being once born.*" Perhaps Locke scholarship can tell us. I do know that that is what he says. And his famous trinity of rights, supposedly the model for Jefferson's statement in the Declaration, reads this way (sec. 87): "Man, being born with a title to perfect freedom and uncontrolled enjoyment of all the rights and privileges of the law of nature equally with any other man or number of men in the world, has by nature a power . . . to *preserve* his property—that is, his life, liberty, and estate . . ." Again, to *preserve* his life.

It appears, then, that the phrase "right to life" entered the language and our common culture only as a sort of shorthand and by accident.

It is in the context merely an aside and an example, and I do not wish to enter the lists here in the contemporary dispute about abortion, but it seems clear that those who oppose it in any and all cases must find some better argument for their position than a supposed right to life on the part of the fetus, as a right basic to all, say, human beings. For, as I suggested before, apart from the facts of history just reviewed, it is not the right to life that is basic as essential to enjoying or exercising any other rights, but rather life itself, and perhaps a bit more, such as competent life. Being alive, or being a being of a certain kind, is the condition of having rights.

In this connection one occasionally hears talk of a "right to be born," and I have heard that countered by an assertion of a "right not to be born." This is something perhaps congenial only to those brought up in a natural rights environment. But surely here we have an object for Bentham's contemptuous phrase, "nonsense on stilts." For if there is a right to be born, we must be able to specify whose right it is and under what conditions it is violated. If we can speak sensibly of a "right to be born"—which I doubt—then we can speak sensibly of "a right to be conceived," and a corresponding "right not to be conceived." And here we have started a game in which all rules are off. It is reported that when a student, terribly bothered by Descartes' demon, said to Professor Morris Cohen, "But Professor, tell me, do I exist?", Cohen replied by saying, "Who wants to know?"

One is also reminded of the old Jewish story, now famous, of the two men mournfully complaining of the woes and sorrows of existence. "Life is so terrible," one of them says finally, "it would have been better never to have been conceived." "True," said the other, "but who is so lucky?—not one in a million."

Whose right is it? Who's asking? Who wants to know?

Rights-talk has got to be more sensible than this if it is to pass rational muster. The alleged "right to life" does not. If it does, we shall have created also the right to be born and the right to be conceived and the right to be brought into existence. But who has such a right, and on what basis is it asserted? The multiplication of such alleged rights can only serve to discredit rights-talk altogether, which in turn will cover up the many and repeated violations of genuine human rights constantly occurring in the actual world in which we live.

6. A recent notice from an organization called "Greenpeace" asks "Do whales have a right to live?", and answers itself, "Yes, they *do* have a right to live."

I find myself wanting to agree with that, without any clear idea of why or what or how. For the peculiarity of assertions such as this, "Whales have a right to live," is that people who assert it are asserting it not of individual whales, but of the species, are asserting that the species has a right to survive. And when we talk of human beings having a right to life we of course are referring to each and every one, not the species of humans.

I wonder if the ease with which we find ourselves agreeing that whales, tigers, elephants, have a right to live is not generated by the ease with which we picked up and repeat the phrase "the right to life."

Do trees have a right to live? Do roses have a right to live? Do mosquitoes have a right to live? Do cockroaches have a right to live? Do bedbugs have a right to live? Do weeds have a right to live? Do these questions have answers?

Do minnows have a right to live? But freedom for the pike, as Tawney said, is death for the minnow. Do pike have a right to live? A right to freedom?

The piece from Greenpeace, after providing a horrendous description of the process by which whales are killed—slaughtered, actually—,observes that when the process of raping the whales' bodies of fat and muscle is finished, "the remains are dumped overboard to the sharks."

But if whales have a right to live, don't sharks have a right to live?

How can we tell?

7. We need to recognize that, even where it is not abused, rights-talk is not all-sufficient. It needs to be supplemented by a concern for and attention to consequences and alternatives, and also by a consideration of duties and obligations. For talk only about human rights, with no consideration of consequences and obligations, is egoistic talk, and can destroy the possibility of a moral community and a moral life. Under such circumstances it would lose all meaning, *including* emotive meaning, and could no longer be used, as it is now so often used, even for the deception of oneself and others.

If everyone were only to assert rights and never acknowledged duties, both rights and duties would lose all meaning and significance because there would be no moral community in terms of which alone they can have significance.

8. But are there basic or genuine human rights? Certainly there are, for there are moral rights. This follows from fundamental principles.

What would happen—how would it be—if no one had rights and if no one were recognized as having rights? It would be intolerable. No one could tolerate a situation in which no one was recognized as having rights and, as a consequence, no one's rights were recognized. A maxim of recognizing no one as having rights could not be willed to be universal law. All rational persons would rationally want others to recognize them as having rights, and consequently must recognize others as having rights. Though specific rights can vary from one to another, fundamental rights are necessarily reciprocal and identical. If *any* one has rights then so must *every*one similarly situated. The supposition that no one has rights thus cannot be sustained. And everyone is similarly situated in being a human being and thus a potential member of the moral community.

The supposition, indeed, that there is a community none of whose members has any rights is self-contradictory. An *organization* there might be with members having no rights—as there might be an organization of robots or automatons—but *community* there could not be. But without community there could be no duties or obligations either. Thus the idea of rights is, it seems to me, essential to moral thought. But principles establish them and it is by reference to principles that they are to be understood and weighed and, where appropriate and called for, limited.

9. Is there any one right that is basic or fundamental? I am not sure that there is, but if there is, I should say that it is the right to freedom of conscience, the right to think as one is led to think through the free and unfettered operation of one's own mind and distinctive personality. I say this because this right cannot be violated without destroying the individual, without destroying the individual's capacity to think, to feel, to be aware and conscious of oneself as an individual person and personality as distinct from a heteronomous automaton. And this is, so far as I can see, the only right of which this is true. This right has obvious affinities with, may even be identical to, the right to be oneself, but I do not discuss this here. It also links, in interesting ways, with other rights of great importance which, lacking the feature mentioned, cannot be regarded as rock-bottom.

10. The question is often raised, which is prior, rights or the community? Do human beings have rights outside of and prior to any community—as is implied by traditional contract theory and maintained today by egoistic libertarians—, or do human beings have rights only within and as a consequence of the existence of the community and of their being accorded by the community—as is maintained by collectivists and social function theorists? The question is, in my estimation, spurious. There is no need to determine which is prior, rights or the community, and no possibility of doing it. These are, I suggest, *polar* or *interdependent* notions. Neither concept can be understood or explained without the other.

There are at least two senses of polar terms that we have to note, one wider than and implied by the other. In one, (1) two terms *A* and *B* are *polar* if the meaning of one involves the meaning of the other. This is the wider sense, in which the relationship is conceptual only. In the other, the narrower stricter sense, (2) *A* and *B* are *polar* if it is impossible for there to be an instance of one without there existing an instance of the other. Clearly (2) implies (1), but not vice-versa.

Instances of terms that are polar in the stricter, existential sense are: buying and selling, north and south, cause and effect. Terms that are polar in the wider, conceptual sense, but not necessarily in the existential sense, include: supply and demand, means and ends, part and whole, peace and war, husband and wife, form and content, and, unfortunately, teaching and learning.

Now it seems clear enough that rights and duties are polar in one of these two senses. I do not stop to determine which. My suggestion here is that so are *right* and *community* polar, in at least the intensional, conceptual, sense: that is, the meaning of one involves the meaning of the other. Whether the *existence* of one entails the existence of the other I am not sure. But even the weaker polar relationship indicates that neither is basic, any more than one of the polar pairs north and south, right and left, husband and wife, buying and selling, must be basic.

The concept of polar notions can be extended to a wider range. Multiple conceptions can be polar—or better, interdependent or multi-polar—and there is illumination in extending the concept in this way. For it enables the polar relationship to be understood. The basis of the relationship between husband and wife is marriage, and there is similarly a basis for every polar relationship. The basis for the polar relationship between rights and duties is the ground or rationale or reason that determines that one person has a duty and another a right. And it is not at all implausible to hold that the notions of rights, duties, moral agents, and the moral community are in some such way as this interdependent.

11. This suggests another reason why, as I suggested before, the expression "moral rights" is preferable, on philosophical grounds, to the expression "human rights."

For they are, as I said, moral rights, rights

which beings have in virtue of morality—fundamental moral principles.

Secondly, they are not just the rights of human beings, which is the suggestion conveyed by the expression "human rights." Animals can have moral rights, as they can be members—or can be treated as members—of the moral community. But how can nonhumans have human rights?

Thirdly, moral rights are polar to the moral community, which transcends all merely political and even cultural boundaries. Thus moral rights are not polar to the actual human community—if there is one—, or to any actual political community. What is polar to the political community are political rights, and in some political communities there may actually be none, except, perhaps, those held and exercised only by the rulers.

By the moral community I mean the community of all moral persons, persons of good will, those who recognize moral rights and duties, the "ethical commonwealth" originally conceived by the Stoics and so eloquently described by Kant in his later ethical works and in his concept of a kingdom of ends.

But of course the expression "human rights" is preferable rhetorically, politically, and practically.

12. None of this is to deny—it is rather to affirm—that human beings have certain fundamental rights, which ought to be, must be, need to be recognized. Any government that denies or violates such rights is to that extent bad, wrong, and illegitimate, and hence has to that extent no claim, no right, to respect or obedience or even to existence. But what this means in practice, and how it is to be applied and carried out into practice, is something else.

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WISCONSIN'S WAR AGAINST RUSSIA, 1918-1919

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As they left America by troopship in the summer of 1918, the Wisconsin soldiers treated in this essay were under the impression that they were on their way to France to wage war against the forces of Kaiser Wilhelm II. At the last minute, however, both their destination and the enemy were changed. Their exact location was now a classified secret.[1] But, in letters to their relatives, the soldiers described many attractive aspects of the place. Geographically the country resembled northern Wisconsin.[2] Forests of pine, spruce, and aspen dominated the largely flat landscape which also featured numerous meadows filled with wild flowers and unusual mosses, as well as clear lakes and rivers. The woods teemed with deer, ducks, geese, woodhens, crows, immense rabbits, and flocks of white chickadees so plentiful that "when they flew it looked like a snowstorm."[3] In summer there were long hours of daylight and mild temperatures. During the months of intense cold the troops were housed in snug, well-heated dwellings which were frequently equipped with saunas. Even the long winter nights were made memorable by brilliant displays of northern lights. And the natives of the region were not too different from the people at home—hardworking, religious folk who loved a good joke and often drank too much.

At the same time there were drawbacks: bottomless swamps and clouds of mosquitoes in the summer. During the winter months homesickness and melancholia were induced by the short days and temperatures as low as −53 degrees Fahrenheit. The food ration, consisting primarily of black tea, hardtack, and canned willy (corned beef), also left much to be desired. Flies, fleas, cockroaches, bedbugs, and ticks were other sources of discomfort. "It's the filthiest place I've ever been in," wrote one Milwaukean. "The cooties keep us dancing every minute." Probably the most unattractive feature of the mission was the imminent danger of death from sickness, mines, booby traps, and rifle and artillery fire. Tragically for the ten Wisconsin soldiers who lost their lives, they were not engaged in practice maneuvers in the north woods, but were fighting a shooting war against the Bolsheviks more than 200 miles deep in the interior of North Russia.[4]

Wisconsin's connection with the affair originated in the distressing news which came out of Russia in the autumn of 1917. First, in November the Bolsheviks easily toppled the pro-Western Provisional Government. And within a few months, to the consternation of the Allies, the Bolsheviks betrayed the West by signing a separate peace with Germany and leaving the war. From the Allied viewpoint, especially that of the British War Cabinet, the Bolshevik action was intolerable, because it would permit the Germans to transfer their army to the Western Front and to gain control over Allied military supplies sent to Russia. The British proposed, therefore, to invade Russia through its northern ports of Murmansk and Archangel, take possession of the extensive military supplies there, and eventually reorganize the Eastern Front with the assistance of Russian volunteers.[5] President Woodrow Wilson, against his better judgment, reluctantly agreed to participate in the campaign. Supposedly the American troops were to be restricted to guarding military stores and to assisting the Czechoslovak Legion—an anti-Communist group of former war prisoners

which was fighting its way across Siberia to Vladivostok.[6]

The 339th Infantry, the 4500-man unit which received the dubious honor of being selected to serve in North Russia, was primarily staffed by draftees from Michigan. In fact the regiment was commonly referred to as "Detroit's Own." To fill vacancies about 125 men from Wisconsin were transferred from Fort Sheridan, Illinois, to Camp Custer, Michigan, where the 339th Infantry underwent basic training. The University of Wisconsin was well represented among the junior officers and infantry assigned to the expedition. Students and recent graduates of the university connected with the affair included H. L. Babbitz, Carl H. Berger, Marcus Casey, Charles Collins, John A. Commons, Lawrence Gooding, Gordon Reese, W. B. Webster, and Malcolm Whyte; Berger and Casey were among the dead. The two American consuls at Archangel also had ties to Wisconsin. Consul Felix Cole, an articulate opponent of American intervention in Russia, spent his freshman year at the University of Wisconsin in 1904-1905, and his assistant, Consul Maurice Pierce, graduated from the university in 1912.[7] The largest Wisconsin contingent served not in the infantry, but in the 310th Engineers; about half the 788 members of this company were from Wisconsin. The other units involved in the affair, the 337th Field Hospital and the 337th Ambulance Company, were almost entirely staffed by soldiers from Michigan, except for a few Wisconsin physicians. According to an estimate by the Wisconsin War History Commission, approximately 500 of the 5710 soldiers sent to Archangel were from Wisconsin.[8]

Unquestionably the troops were inexperienced as their training had consisted of only a month at Camp Custer, followed by a second month spent in crossing the Atlantic. Arriving at Aldershot, England, they learned of their new destination and were outfitted by the British with winter equipment, including snowshoes, fur caps, long woolen coats, and the Shackleton boot, which proved warm, but slippery and vulnerable to dampness. Colonel George E. Stewart, the commander of the 339th Infantry, facetiously asked the British whether they intended to carry out the "Britishizing" process to its ultimate extent by issuing him five thousand monocles.[9] The soldiers' American rifles were replaced by Russian rifles (manufactured by Westinghouse), but the men had little confidence in them as the ammunition frequently jammed and they were said to be so inaccurate as to shoot around corners. Moreover, the bayonet was fixed immovably to the rifle and rapid fire was impossible. Each man had fired only ten rounds with the rifle on a range before the 339th departed from Newcastle on August 26, 1918.[10]

Three weeks previously the British had boldly seized the port of Archangel. On August 1 Major-General Frederick C. Poole and a naval flotilla equipped with two seaplanes overwhelmed Bolshevik defenses on nearby Mudyug Island. During the afternoon and evening the Bolsheviks fled southward toward Vologda by railroad and by boat toward Kotlas on the Dvina River. The next morning (August 2) a new socialist government, which had just seized power in a coup, invited Poole and his tiny force of fewer than 1500 onto Russian soil.[11] As the troops marched to the government buildings they were greeted with cheers, whistles, and the waving of handkerchiefs. However, Felix Cole, the 30-year-old American Consul at Archangel, detected an ominous note in the proceedings. Only the middle class and the peasants, the two groups which had suffered the most at the hands of the Bolsheviks' demonstrated approval. "The working class," Cole perceptively observed, "was patently absent."[12]

Even prior to the arrival of the 339th Infantry, Poole commenced his campaign to conquer North Russia. Within a few days allied forces were able to advance 40 versts (26 miles) to the south on the Archangel-Vologda Railroad before being stalled by

burned bridges and rear guard sniping from engines. Preparations were hurried to chase the retreating Bolsheviks on the Dvina River as well, although Poole was temporarily delayed by an acute shortage of transport. A start was made at recruiting Russians into the "Slavo-British Legion"; however, only a few hundred enlisted, the majority of whom were either old and hungry or repatriated prisoners of war.[13] The amateurish nature of the enterprise shocked realistic observers such as the British representative in Moscow, Bruce Lockhart. "We had committed," the incredulous Lockhart noted in his memoirs, "the unbelievable folly of landing at Archangel with fewer than twelve hundred men."[14] Further folly was soon added when the intervention was expanded following the arrival of the bulk of the American forces on September 4, 1918.

Due to circumstances beyond their control about one-third of the Americans were in no condition to fight a war. Shortly after leaving Britain a virulent strain of "Spanish influenza" broke out on two of the three British transports. The illness frequently proved fatal even to young men in good health and it spread rapidly due to the close quarters on shipboard. By mistake practically no medical supplies had been placed on board the ships and the few medicines left over from training at Camp Custer were soon exhausted. "Congestion was so bad," recalled one soldier, "that men with a temperature of only 101° or 102° were not put into the hospital but lay in their hammocks or the decks."[15] Therefore, when the men arrived at Archangel the situation was serious, but only 25 seriously ill Americans could be accommodated by the British

Fig. 1. Funeral procession of Marcus T. Casey of New Richmond, Wisconsin, at Archangel, Russia, September 18, 1918. Photo no. 11-SC-28605 in the National Archives.

53rd Stationary Hospital. Under the direction of Major Jonas R. Longley of Fond du Lac, who was himself "nearly dead of the disease," an American hospital was established with supplies and nurses furnished by the American Red Cross and the Russian Red Cross. In September 378 Americans were afflicted by influenza and eventually 72 died of the disease or the resulting pneumonia. Lt. Marcus T. Casey of New Richmond, a law student at the University of Wisconsin, was the first of three Wisconsin soldiers to succumb to the disease. At Archangel Casey received an elaborate military funeral which was heavily attended by the well-to-do.[16] (Fig. 1) However, as had been the case when General Poole landed a month and a half before, the laboring classes were conspicuously absent.

For a time the local manufacturers of coffins were unable to keep up with the demand and the churches worked overtime conducting funerals for the American and Russian victims. One American medical officer observed that the Orthodox priests routinely used the same yellow robe to cover all corpses and that during the funeral chants each member of the congregation kissed the same spot on an icon held by the priest. "It is their belief," he noted, "that during a religious service it is impossible to contract disease."[17] The high death rate may also have been aggravated by the general lack of sanitation at Archangel. The sewer system consisted merely of ditches under the sidewalks which emptied into cesspools. "This is some city," reported Lt. Charles Ryan to Professor John R. Commons. "It can be smelled for quite a distance. Among his other crimes, Peter the Great was responsible for this place."[18] Under normal circumstances the cesspools were periodically emptied and their contents carted off to the swamps and tundra. But as Major Longley pointed out: "Due to the disorganization resultant from war conditions, the labor necessary to effect this had been lacking, the cess pits had overflowed, flush latrines had become plugged and human excreta was conspicuous and abundant both inside and outside of buildings . . . The situation was made worse by the Influenza Epidemic which started among the troops on the way to Russia."[19]

Under the supervision of the 310th Engineers—about half of whom were from Wisconsin—the odoriferous job of emptying and cleaning latrines and cess pits was begun. Bathhouses, incinerators, and a delousing station (the "cooty mill") were constructed. As a result, noted Longley, "before winter made outdoor work impossible, the situation had been greatly improved."[20] During a brief general strike, called to protest the temporary displacement of the socialist government by a coup, Company "C" of the engineers received somewhat more pleasant duties. Now they were detailed to operate the Archangel power plant, the waterworks, run a sawmill, and operate the local streetcar system. One problem with the latter occupation was that the Americans neither knew the language nor understood the value of the money presented by the passengers. Therefore, as one participant recalled, "No change was ever given. The motorman would go down the street hollering Michigan Avenue, Woodward Avenue and other streets in Detroit."[21]

In the meantime General Poole had sent about half the American troops southward by railroad toward Vologda. At first rapid progress was made as the Allies captured Oberskaya about seventy miles to the south. Soon surprisingly determined resistance was encountered, which led Poole to the mistaken conclusion that German officers were directing the defense. Another unexpected obstacle was the swampy terrain. As summed up by Poole: "The country consisting of practically nothing but forest and bog presents the most extraordinary difficulties. This renders any attempt at a turning movement both difficult and slow. For a detachment to have to wade waist deep in bog even on patrol work is an almost daily occur-

rence."[22] Between Archangel and Vologda (425 miles to the south) there were 262 bridges and, noted Poole, "as my forces stand at present I shall be held up at every bridge, each of which takes some days to repair."[23]

The hard physical work of replacing the wrecked bridges and track fell to the engineers. As a result, many of the Wisconsin men on the Railroad Front became more adept at construction work than at the use of weapons. Most of the bridges were short one-span structures supported by steel girders which rested on masonry abutments. In destroying the bridges the Bolsheviks customarily dynamited the girder span. Often the Americans found that it was possible, through the use of jacks, to lift the span back into place and support it with round timber and ties. Altogether the engineers estimated that they constructed 3000 feet of timber bridges. One of their most imaginative projects was the secret building of a 60-foot crib bridge in preparation for a fall offensive against the Bolshevik armored train, located just north of Plesetskaya at verst 455. As described by the officer in charge:

> This work was completed in two nights, and was entirely finished before the enemy knew that an advance was anticipated. Not a single spike or bolt was driven on the job. Railway spikes were driven into the ties behind our own lines, and ties carried up and placed. Finally the rails were forced in under the heads of the spikes, and were permanently fastened after the advance.[24]

Despite these preparations the offensive proved unsuccessful. A party of engineers had hoped to slip to the rear of verst 455, destroy the track and trap the Bolsheviks. But the engineers were unable to accomplish their mission due to the swampy ground. Therefore, when the Allies attacked at 6:40 a.m. on October 14 the Bolsheviks simply withdrew their armored train and troop train, destroyed another bridge and surrendered three versts (about two miles) of track.[25] Despite the setback, General Poole remained convinced that just a few more battalions would enable him to launch a successful winter offensive. "If we succeed in reaching Vologda, we may well open up line to Viatka," he predicted.[26]

In London the War Office was now having second thoughts about Poole's grandiose plans. At the same time the Wilson administration began to raise objections to Poole's use of American troops for offensive operations. As Secretary of State Robert Lansing instructed Ambassador David R. Francis, "all military effort in northern Russia [must] be given up except the guarding of the ports themselves and as much of the country round them as may develop threatening conditions."[27] Furthermore, when Poole made a short trip to London in mid-October, he found that not only had his plan for a winter campaign been rejected, but that he was being replaced by 38-year-old General Edmund Ironside. The change in leadership meant also a major shift in strategy as Ironside was instructed that his operations were to be "limited to the defensive and to the training of the Russians."[28] In other words, the offensive phase of the campaign had come to a premature end.

There remained an enormous amount of physical work for the engineers to perform in preparing a strong defensive position. First, the front line at verst 455 was strongly fortified with barbed wire entanglements (constructed from 40,000 rolls of wire found in Archangel), and these were supplemented by 316 shellproof blockhouses, 273 machine gun emplacements, and 167 infantry outposts. One of the most tedious and back breaking jobs was cutting lanes of fire through the dense timber. Further to the rear the engineers constructed barracks, and converted railroad box cars into sleeping quarters for the troops. Two hundred fifty-seven cars were double lined with six-inch-thick sawdust filled walls; bunks, stoves, and electric lights provided by an old airplane engine completed what were, by the stan-

dards of North Russia, deluxe accommodations. A Canadian aviator who toured the American train noted that it was "about as close to the Ritz as we are likely to get out here."[29]

Fewer engineers and therefore fewer Wisconsin men were involved in the second major phase of the expedition in which the British sought to advance along the Dvina river to Kotlas where a branch of the trans-Siberian railroad terminated. Among the Wisconsin officers assigned to this front were Captain Joel Moore, and Lieutenants Francis Cuff, Glen Weeks, and John Cudahy. Pursuing the retreating Bolsheviks by boat, the Americans at first made impressive progress against only light resistance. By the end of September the Allies had easily captured the cities of Toulgas on the Dvina and Shenkursk on the Vaga, the latter regarded as the most important city of the region after Archangel. "But," as John Cudahy observed in his memoir of the campaign, "before these forces had been halted, already the Vaga Expedition had gone too far, thrust out nearly one hundred miles from the Railway, and fifty miles further south than the Dvina River party, it presented inviting opportunity for enemy encirclement."[30] Another disquieting aspect of the situation, recalled Cudahy, was that Shenkursk was garrisoned by locally recruited Russians whose training, bravery, and loyalty were highly suspect. Actually, General Ironside was well aware of the overextended nature of the position he had inherited from Poole. However, for political reasons it was decided to hold the area through the winter, as it was felt an evacuation without a fight would deal a shattering blow to Russian morale (Fig. 2). Besides, reasoned Ironside, "I considered that my intelligence was good enough to give me sufficient warning to operate a successful evacuation to prevent our force from being shut in."[31]

The month of October in Shenkursk was relatively uneventful as the troops worked at

Fig. 2. Point of furthest advance by American forces in North Russia, 28 versts from Shenkunsk. The village of Pagosta in the distance was occupied by the Bolsheviks and the church towers were used as an observation post. Eleven days after this photo was taken, the Bolsheviks launched a surprise offensive which forced the Allies to abandon this point and Shenkunsk as well. Photo by Sgt. Grier M. Shotwell, Signal Corps, January 8, 1919. Photo no. 111-SC-152825 in the National Archives.

patrolling and, when it was not raining, building fortifications. One Wisconsin officer, Lt. Glen Weeks, noted in his diary that much of his time was occupied with writing letters and opening mail, having his teeth cleaned, and shooting three wild turkeys which were served with an excellent peach pie.[32] The signing of the Armistice on the Western Front on November 11, 1918 at first produced a mood of elation. But the arrival of cold weather, the closing of Archangel by ice, and the realization that there was no end in sight to the campaign, produced what Ironside called "a bad effect upon the weaker members of the command."[33] The widespread dissemination of Bolshevik propaganda and reports of demobilization in the West further contributed to sagging morale.

Demonstrating a familiarity with the terrain and ignoring the Arctic winter the Bolsheviks gradually took the offensive against the overextended Americans. On the very day the war ended on the Western Front the Bolsheviks subjected Toulgas to an intense artillery barrage. On this occasion, reported Ironside, the day was saved "by the exceedingly gallant behavior of the drivers of a Canadian battery; on the 11th November they turned out and annihilated a strong enemy force which had got round the rear of our forces and threatened them with capture."[34] Meanwhile the Vaga column experienced increased pressure. Lt. Weeks, now stationed at the most advanced American outpost of Ust Padenga (located eighteen miles from Shenkursk), recorded numerous instances of increased Bolshevik activity. On November 13 a four-man patrol fell into a trap from which only one escaped. The three victims were "mutilated sadly." Four days later "we caught two spies trying to find out our position, outpost strength, etc. Lt. [Frances W.] Cuff [of Rio, Wisconsin], Lt. [J. D.] Winslow [of the Canadian Field Artillery], and myself took one of them out in the woods and shot him." The next day in honor of the first sunny day in three weeks, the officers "went out and buried [the] spy."[35] On November 29 an American patrol of 60 men, seeking to locate the exact position of the Bolsheviks, ran into a strongly defended position in a forest clearing. An enemy force estimated at 400 men tried to surround the Americans who hastily retreated, being "severely handled in the process."[36] Fifteen Americans died including Lt. Cuff, who "was killed after he was almost out of the enemy territory."[37]

During the month of December, Bolshevik probing became more and more persistent and, in response, Ironside ordered increased Allied patrol activity to discover the enemy's strength. Learning that 200 Bolsheviks had occupied Kodema, located 20 miles east of Shenkursk, Col. C. Graham, the British commander at Shenkursk, ordered a similar sized force of Americans and Cossacks to recapture the place. Weeks, who participated in the operation, recorded that the column made its approach march at night in a snowstorm. Arriving at Kodema at 5:45 a.m. on December 7, the troops prepared to attack but abandoned the plan when "the pom pom [a small one-pound cannon] would not work,"[38] Lt. Henry Katz, who was assigned as regimental medical officer, observed that the machine guns froze also and therefore "we retired without firing a shot." A week later Katz was present as a second American attack on Kodema miscarried. Due to "some mistake in orders" the frostbitten Americans failed to advance in support of a hundred attacking Cossacks. "It was very cold and trip very hard on the men," he noted.[39] A completely different interpretation was recorded by Ironside. In his view the attacks "failed owing to the quality of the U.S. troops and the behaviour of one of their officers, and gave the enemy an idea of the value of our troops opposed to them."[40] Then a few weeks later the 280-man Caucasian Cossack Regiment, despite two months of training, also failed in an attack upon Kodema. "The enemy were noticed to be in greater numbers than had

been expected," recorded Col. Graham, "and in addition to the committing of several tactical mistakes the Cossack Cavalry got out of hand and could not be rallied."[41] Weeks and his troops were sent out from Shenkursk to gather stragglers and re-establish order.[42] In Ironside's opinion the disastrous performance of the Cossacks further demonstrated to the Bolsheviks "the lack of value of our troops."[43]

The next few weeks were unusually uneventful. Weeks' diary entries mentioned concerts featuring "very good" singing by the Russian Y.M.C.A., a visit to the local jeweler, card playing, reconstruction of Shenkursk's fortifications, and extreme cold which reached −27 degrees. "Not much change in conditions in general," he recorded on January 17.[44] The next day General Ironside arrived for an inspection and was thus present at Shenkursk when the Bolsheviks launched a surprise New Year's offensive against Ust Padenga at 6:15 a.m. on January 19. As Ironside summarized the situation:

> The enemy attacked with great gallantry and considerable organization. The American troops at Ust Padenga and the Cossack Infantry made a gallant resistance, but were driven in by force of numbers. All the Troops, both Russian and American, did very well this day. Casualties were about 50 out of a number of about 450, and the shelling was heavy.
>
> Seeing that the enemy attacks were growing stronger and stronger and that casualties had increased, I ordered the evacuation of Shenkursk late on the 24th.[45]

Throughout the battle Weeks and his platoon protected the line of communication between Shenkursk and Ust Padenga. By the evening of January 23 the platoon was ordered to retreat to Shenkursk and Weeks for the first time realized that the situation was serious. An all-day bombardment of Shenkursk, which "set fire to part of our billets," was followed by a daring night retreat over an obscure winter road which the Bolsheviks had neglected to block. The main body of Americans departed at 1:30 a.m. on January 25 and Weeks, who was assigned to the rear guard, was one of the last two Americans to flee the city at 3:00 a.m. Fortunately the evacuation was not detected and after a retreat of 50 miles a new defensive line was successfully established. "The Bolo [slang for Bolsheviks] tried to knock us out," recorded Weeks, "but our line stuck."[46]

For two weeks the atmosphere remained tense as the Bolsheviks probed with patrols and lobbed artillery shells. However, by early February the military pressure subsided as Allied planes reported that the Bolsheviks had pulled back their troops and artillery. On February 7, for the first time since the start of the Shenkursk offensive, Weeks was able to change clothes and get a good night's sleep. Much of the lieutenant's time was now taken up with letter writing, playing dominoes and cards (black jack and "chase the ace" were the most popular games), and on February 23 his company played a game of baseball in the snow against the Canadian artillery men (losing by the score of 21 to 5).[47] Yet, from Ironside's perspective, the American troops conducted too little in the way of physical training and as a result the "American troops deteriorated rapidly even from the low value they already possessed, through the incompetence of their officers in this portion of their duties."[48]

In view of all the factors against them—enemy attacks, long hours of duty, the lack of reserves, bitter weather, and unappetizing food—it is hardly surprising that the 339th Infantry experienced a severe crisis of morale. As one injured soldier noted after his return to America in April, "A spirit of restlessness has been spreading over the whole regiment since the armistice. No one has been able to tell the men why they were fighting in Russia, and naturally their morale was not what it should have been."[49] Dr. Arthur Nugent, a Milwaukee medical officer, recalled that the Americans who fought Germany on the Western Front had

no difficulty in understanding their mission. "But we were fighting a people against whom war had never been declared and we didn't know why we were fighting them."[50] None of the officers seem to have been able to offer the troops any coherent explanation as to why they were being asked to risk their lives. When Col. George Stewart, the highest ranking American officer in North Russia, addressed troops on the Dvina Front, he tactlessly remarked that the men should understand that his work at Archangel was just as difficult as theirs, if not more so. According to their commander, the men were "very disappointed by the talk he made to them as it did not explain what they were here for."[51]

Letters critical of the shaky morale of the troops began to filter through the heavy veil of official censorship. Most of the letters were smuggled out of Russia by wounded soldiers and then printed in the *Congressional Record* or released to the press by such critics of the venture as Senators Charles E. Townsend of Michigan, Robert LaFollette of Wisconsin, and Hiram Johnson of California. "This is the most God-forsaken country I have ever seen," wrote a Milwaukee mechanic.[52] "I'm full up on Russia, and ready to move now," wrote another Milwaukean.[53] Others complained of the distasteful British ration which neither dogs nor cows would touch. Captain Joel R. Moore of La Crosse wrote of an occasion when the menu featured "grass stew" and one soldier gave his portion to a Russian woman. "She tasted it," recorded Moore, "and then threw it on some hay before the cow. The cow refused to eat either the 'grass stew' or the hay."[54] Under the circumstances, the 339th Infantry felt forgotten and abandoned. The disillusioned soldiers exchanged bitter remarks such as, "It's hell to hang on, but it's death to stop," or "We are one outfit that hasn't had to worry about finding jobs after the war. We keep right on with what we are doing."[55] The letters he had received about conditions in North

Fig. 3. Verst 455 Railroad Front, February 17, 1919. "I" Company is lined up preparatory to the awarding of the French Croix de Guerre to eight soldiers for bravery. Captain Horatio G. Winslow of Madison is in front of the company. Six weeks later "I" company was inaccurately accused of having mutinied. Photo no. 111-SC-161083 in the National Archives.

Russia, proclaimed Senator Johnson, made "an American hang his head in shame."[56]

Still, most Americans had little if any awareness of the North Russian expedition until the press carried sensational accounts of a "mutiny" by American troops at Archangel. According to the reports and a subsequent press release by the War Department, members of "I" Company, while stationed at Archangel, refused on March 30 to pack their equipment and return to the front. It took a personal appeal from Col. Stewart to persuade the men to obey the order, and even then, the men insisted upon the release of a soldier who had been confined to the guard house for insubordination. The troops also asked such questions as "Why are we fighting in Russia?" and "Why are we being sent to the front now that war on the Western Front has ended?"[57] Captain Horatio Winslow of Madison, the commander of Company "I", was the recipient of much unwanted publicity (Fig. 3). One Wisconsin newspaper ungraciously suggested that Winslow had been subverted by insidious socialist and Bolshevik propaganda.[58]

All connected with the affair agreed that the term "mutiny" was a distortion of what was basically a trivial incident. One returning soldier recalled, "We kicked like hell, but we didn't mutiny"; another called it "a case of shattered nerves, not mutiny."[59] Major J. Brooks Nichols of Detroit regarded the incident as a misunderstanding and said, "I have heard more 'bunk' about this mutiny than could be written in a dozen books." Captain Winslow concurred stating, "There was no mutiny."[60] A thorough investigation by Brigadier General Wilds P. Richardson confirmed that the incident was "of not a very serious character." In his view, the non-commissioned officers could have handled the affair more forcefully, but he commended Col. Stewart for talking to the men and explaining to them the serious consequences of disobeying an order. Further action in the case "could not have served any good military purpose," concluded Richardson.[61] However, DeWitt Poole, the American Chargé at Archangel, regarded the incident as an object lesson and urged the State Department to announce a definite date for the withdrawal of the troops. To leave the 339th Infantry in Russia past the month of June was "quite out of the question."[62]

The widely publicized affair further impressed upon the Wilson administration the necessity of extricating itself from a situation which was not only untenable from a military point of view but from a political one as well. Senator Johnson shrewdly accused the Wilson administration of having submitted to a *de facto* league of nations by accepting British command over the American forces in North Russia. "Under the orders of foreign nations Americans wage war without declaration by the American Congress or the consent of the American people," he charged.[63] Wisconsin Governor E. L. Philipp demanded an immediate pull-out of the troops. "Our country is not at war with Russia and we should not keep an army in that country," he stated. "I am in favor of withdrawing our army at once."[64] In fact the Wilson administration had already taken steps to pull out unilaterally. A few weeks previously Brigadier General Wilds P. Richardson, an officer with Alaskan experience, had been appointed to command the American forces in Russia and to supervise their evacuation. When Richardson met the President at Paris in mid-March to discuss his assignment, Wilson was emphatic in criticizing the British use of the American forces and stated that he desired the withdrawal of all Americans "as soon as practicable after the opening of navigation."[65]

Fortunately for the demoralized American forces, the expected large scale Bolshevik spring offensive never materialized. The diary of Lt. Glen Weeks now dealt with such matters as melting snow, fishing, duck hunting, card playing, two fighting roosters falling into a well, and the court martialing of several of his men to determine where they

had got their "gabby water." A woman presented Weeks with two dogs which were appropriately named Lenin and Trotsky. Retreating toward Archangel Weeks laconically recorded: "We burned the mill in the woods outside of Shuskega," and on May 2 he noted: "Beautiful day . . . Gunboats bombarded Kurgomen. Burned the two churches. We took a couple of prisoners; also arrested a family caught signalling to the Bolo gunboats. They had a dance at the Y. I wrote a couple of letters in the evening." By late May the main subject of the diarist's concern was how to defeat the Canadian artillery men at baseball. Unfortunately, in the last inning "our men went to pieces and the Canadians beat us." A rematch was aborted when the baseball refused to stay in one piece.[66]

Finally at 5:30 p.m. on Saturday, June 7, Weeks and his troops arrived by boat at Archangel and eight days later, dodging large ice flows in the White Sea, the transports *Menominee* and *Porto* evacuated all but a small rearguard of the American North Russian Expeditionary Force. During a brief stopover at Murmansk, a "dirty town of shack buildings," the troops experienced their last taste of combat. Unwisely the *Menominee* was docked opposite an incoming British troopship bringing large reinforcements to Archangel. What began as mere "ribald banter" between British sailors and American soldiers soon degenerated into an exchange of insults.[67] According to a British pilot who witnessed the affairs, it was the Americans (objecting to being called "bloody hobos") who began throwing lumps of coal. Before the pilot "could say 'Jack Robinson' buckets of coal were being handed up from below at an amazing speed." Numerous casualties were recorded on both sides, but it was the British, throwing bottles in addition to coal, who took the honors. "I saw one Yank take an enormous lump full in the face," recorded the British observer. Finally, one of the Americans "committed a dastardly act," by throwing an open jack knife which missed its target. Such cowardice, maintained pilot Ira Jones, explained the Americans' "unenviable war record in Russia."[68] The remainder of the trip was far less eventful. On June 26 the *Menominee* arrived at Brest, and five days later Lt. Weeks and members of the 339th Infantry sailed for America on the S.S. *President Grant.*[69]

For the time being the reinforced British troops remained in North Russia. By September, however, they too abandoned the cause as hopeless. For a few months the shaky "Provisional Government of the Northern Region" managed to stagger along while the Bolsheviks concentrated upon defeating White Russian forces in Siberia and the South. The defeat and execution of Admiral Kolchak in early 1920 meant the inevitable. On February 19 the Northern Provisional Government fled to Britain and two days later, without firing a shot, Bolshevik forces entered Archangel to the acclaim of the population.[70]

So far as the Wisconsin participants were concerned, the North Russian expedition was by then no more than ancient history. In mid-July the 339th Infantry arrived at Detroit and was given a tumultuous welcome which included a ticker tape parade and a Chamber of Commerce reception. Within a week the soldiers were discharged to return to their homes and the routine of civilian life, occasionally to reminisce about their experiences at reunions of the Detroit-based Polar Bear Association. Like the rest of the country, most of the Wisconsin soldiers wanted merely to forget the whole unpleasant experience as soon as possible. Many felt a sense of chagrin and rejection for having been associated with a "mutinous" regiment which fought an unpopular and unsuccessful war. "Whether willfully or unwillingly," wrote John Cudahy, "our country had engaged in an unprovoked intensive, inglorious, little armed conflict which had ended in disaster and disgrace." In his view the North Russian expedition

"will always remain a depraved one with status of a free-booter's excursion."[71] Much of the soldiers' resentment was directed at the British and at General F. C. Poole in particular. As Capt. Robert P. Boyd of Eau Claire told the local Kiwanis Club, Poole thought the Russians would rally to do the fighting while the Allies guarded supplies. Instead, "the Russians stole the supplies and we did the fighting."[72] The soldiers' opinion of the enterprise was aptly summed up by a doughboy's ditty brought home by one Wisconsin engineer:

It's the land of the infernal Odor
The land of the National Smell
The average American soldier
would sooner be quartered in Hell.

It's back to the States for Yours Truly,
I'm not wishing anyone ill
But Russia can hang for all I care
And truly I reckon she will.

Yes it's back to the States for Yours Truly,
A sadder but wiser young chap
The Lord played a joke on Creation
When Russia was dumped on the map.[73]

Did nothing at all beneficial result from the experience? Several of the Wisconsin soldiers suggested that the nine months in Russia had turned them into something resembling superpatriots and had made them appreciate many things in America they had previously taken for granted. Writing to professor Carl Russell Fish, Lt. John A. Commons remarked that the war had "made damn good Americans out of our soldiers . . . And, if you should care for a very exciting 5 minutes at any time, just mention Bolshevik or I.W.W. to a member of the 339th."[74] Or, as expressed by Capt. Robert P. Boyd, all those lucky enough to come back from Russia alive were certain to be "better men and better citizens, to be more contented with less envy, willing to work and to clean up the backyard."[75] Certainly the Wisconsin soldiers had no reason to hang their heads. It was true, of course, that the 339th Infantry was not well prepared for its assignment (General Ironside said he had never seen any American regiment in France as "bad" as the 339th Infantry, and that the troops had received "absolutely no training and the officers are one and all of the lowest value imaginable").[76] But it was also true that the British commanders were utterly unrealistic in their expectations. In the opinion of General Richardson, the British seemed to think the Americans "were imbued with some quality of inherent ferocity and desire for blood which would cause them to do all the fighting willingly and eagerly, even though commanded by incompetent British officers." Based on his four months at Archangel, Richardson concluded that the American troops had ranked "well at the top of all of the troops in North Russia, both as to character and accomplishment."[77]

Transported by an historical accident from the pastoral life of Michigan and Wisconsin to the tragicomedy of the Archangel intervention, the soldiers of the 339th Infantry were deserving of the eulogistic sentiments expressed by Senator Hiram Johnson: "They served under conditions that were the most confusing and perplexing that an American army was ever asked to contend with, but they did their duty."[78]

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INCIDENT AT NORTHLINE

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Throughout the United States today there is renewed racial and religious intolerance which is surfacing in reaction to increasing world and national social, political and economic instability and polarization. This illiberality is especially manifested by the preachments of hatred and bigotry on the part of such extremist organizations as the American Nazi Party, particularly vigorous in Illinois, California, New York and Maryland; a resurgent Ku Klux Klan which is currently not confining its endeavors to the South, but is also assiduously laboring in such fields as New Mexico, Arizona and California; and the Posse Comitatus which is currently conducting underground law and order campaigns and operations in Wisconsin. In view of this occurrence, it is well to recall what can befall a community's social fabric when residents succumb to the fears generated by agents of bigotry who would exploit the nation's ills for their own distorted ends. Nearly fifty-five years ago inhabitants of Hudson, then a sleepy hamlet located on the St. Croix River in northwestern Wisconsin, were so afflicted.

As a case study Hudson is both interesting and important since, in certain respects, this community continues to bear the scars inflicted by the societal plague experienced throughout this period. At that time, the United States as a whole was beset by the Red Scare and the urge to return to the false security of isolationism. Thus, during the decade of the twenties, there reappeared on the national scene fanatics who were fully determined not only to make the United States safe for Americans, but also to reconstitute this country's social fabric in their own warped image.

In Hudson the fanatics were the Knights of the Ku Klux Klan. This organization spread its influence and invective throughout the northern and western sections of the United States. Such ideology was introduced to Wisconsin from the Klan's stronghold in Indiana by specially trained agitators. One of the areas in Wisconsin to be particularly troubled by the Klan's presence was St. Croix County.

Though the Klan entered Wisconsin in the early twenties, the hooded order did not commence its operations in western St. Croix County until June 1926. Hudson, the county seat, was one locale which was especially torn asunder by the Klan activities. It was not long before Hudson's Roman Catholic community, whose members were the particular targets of these individuals, felt the sting of Klan vituperation and innuendo. What follows is an account of Catholic reaction to Klan malignities and the results thereof.

During the second week of June, there were rumblings in Hudson that some kind of Catholic protest was to be registered against the Ku Klux Klan's Northline meetings. Northline, approximately three miles northeast of Hudson, was both a junction and way station on the old Omaha Railroad. Located about one mile east of this junction, the Klan tent was pitched on a rented plot of ground. On a clear salubrious evening the Catholics chose to make their stand. At approximately eight o'clock on June 14, the Knights of the Ku Klux Klan began to assemble for their meeting. Marching as a body, the protesting Catholic delegation soon arrived. Arguments ensued and, to the dismay of the Klansmen, the Catholics managed to gain access to the tent.

Father Peter Rice, Pastor of St. Patrick's Catholic Church in Hudson, arrived soon thereafter. He approached the stage with the purpose of proving false the Klan attacks on the Catholic Church. Rice failed in his

attempt and general disruption ensued. Klan speakers soon fled the scene. Under what appeared to be suspicious circumstances, and as a final climax to the evening's proceedings, the Klan tent, with its appurtenances, burned to the ground. It was an incident which achieved instant notoriety and which resulted in acrimonious feelings for all involved.

As reported by the *St. Paul Dispatch,* the Klan tent was alleged to have been burned after the meeting ended in a near riot. Several hundred men were said to have protested against anti-Catholic statements made by Alfred Brown, a Klan speaker. One thousand persons had gathered to hear Brown. Rice was said to have gone to the platform protesting that the meetings, held at Northline for the past week, were anti-Catholic in nature. Still, the lecturer attempted to continue. Subsequently, the meetings ended with several encounters between opposing factions, though none was serious. It was at this point that the tent was burned.[1]

In its version of the incident, the *New Richmond News* noted that the Klan tent was destroyed by fire of an unknown origin "together with the piano, seats and everything." Prior to the fire a rather boisterous meeting was held. "There was no storm during the night, so the tent evidently was not struck by lightning."[2] According to the Spring Valley *Sun,* 1000 people were gathered to hear Alfred Brown. Brown was said to have challenged a Catholic priest to answer him. Rice appeared with several hundred supporters. After he proceeded to the platform, a row developed.[3]

Warrants were soon sworn out for the fourteen individuals suspected of being involved in the Klan tent burning. Charging the suspects with disturbing a public meeting, the warrants were issued on the complaint of J. H. Neff who was said to be the Ku Klux Klan organizer at the meetings. On Saturday, June 19, eleven of the defendants were arraigned before Judge Otto A. Arnquist at Hudson Court House. All concerned pleaded not guilty and were later released on a one hundred dollar bond, with their cases being adjourned until June 28.[4]

In an editorial entitled "He Who Casts the First Stone," the Spring Valley *Sun* stated that the burning of the tent was to be regretted particularly because of the effects the incident would produce. No one, explained this journal, believed that the Klan would fail to retaliate. It was now time for cooler heads to prevail lest serious consequences follow. Violence would beget violence. Hatreds created as a result of this affair would last a lifetime.[5]

At the preliminary hearing, on the morning of June 28, Judge Arnquist opened the proceedings. Describing the hearing's setting, the *St. Paul Dispatch* said the fourteen defendants were under an armed guard of ten deputy sheriffs. Five hundred persons jammed the court room one half hour before the hearing commenced. "Hudson is filled with automobiles of farmers and persons from neighboring cities and towns. They began arriving early today and were still coming at noon." Excitement was said to be at fever pitch. Not only was the court room filled to capacity, but hundreds were said to be milling also about the halls and the Court House grounds. There was jeering from the crowd when organizer Neff testified. Arnquist issued a severe rebuke. Later in the morning, he announced that due to wide interest in the proceedings he would permit "'wide latitude in the testimony in order that the truth about the Klan might be made known and to discourage and set right some of the rumors that have been circulated.'"[6]

According to the *St. Paul Pioneer Press,* five hundred persons braved the heat and jammed the court room to overflowing. "Two girls in the crowded court room fainted from heat in the forenoon session and several others succumbed to the heat in the afternoon." Hudson was said to be sharply divided on the matter. Due to a manifestation of partisanship during the hearing, St. Croix County Sheriff M. C. Emerson was ordered to clear the court room at the next display of such action.

"This order was issued after repeated cautionings and rebukes from the bench."

Further tension was added, said the *Pioneer Press,* when Ray C. Twining, an attorney from Milwaukee, arrived on the scene. His purpose in coming to Hudson was soon evident. It was Twining's intention to sue fifty Hudson businessmen for the sum of $2000 in damages in connection with the tent burning affair. This "intention to sue for damages was made in letters received by the businessmen a week ago, but was not taken seriously until late today when Twining arrived to gather evidence for his case."[7] Twining said he definitely planned to go on with the suit.

Any excitement that was evident during the first day of the hearing, said the *St. Paul Dispatch,* had disappeared by the second day of the hearings. Hudson had returned to an orderly condition.[8] Parallelling the *Dispatch*'s story in this regard, the *New Richmond News* noted that the interest in the proceedings appeared to have waned materially as the "morbid curiosity seekers concluded the day before that there wasn't going to be anything doing in their line." Reporters described the day as "sweltering" and "torrid" with the court room packed to the suffocating point. As to disorder in the court room, the *News* remarked that there was not foundation to the stories appearing in a certain St. Paul paper, items which were to be chalked up to the excitement and imagination of the young reporter. What fever pitch existed was due to the torrid temperatures and lack of ventilation. People were standing in the aisles, along the sides and in the rear, with others standing on chairs or perched on window sills, radiators and tables. Still others stood within the rail. The "court room was a sort of a Turkish bath on a large scale. People perspired gallons and gallons and everybody reduced very materially."

As to the matter of the armed guard, Sheriff Emerson said "'Why, there's absolutely nothing to the "ten deputies" story.'" There was on duty "'but one deputy and myself and nothing for us to do in the way of maintaining order. There was no disorder of any sort.'" Emerson never saw a "'crowd of that size more orderly despite the lack of chairs and despite the torrid heat.'" Whatever violence there was, said the *News,* "was confined entirely to the vigorous use of fans" and whatever could be converted into such.[9] Still, the *Hudson Star Observer* noted that "considerable partisanship was manifested and on two occasions Judge Arnquist threatened to have the court room cleared by Sheriff Emerson unless better order prevailed."[10]

During the course of these proceedings, the *New Richmond News* also noted the appearance of attorney Twining from Milwaukee. Twining told a *News* correspondent that he represented the state organization of the Ku Klux Klan and was keenly interested in the deliberations. A civil suit would be brought against fifty Hudson businessmen to recover damages for the Klan tent destruction. These businessmen had received a letter from Twining stating that he had been retained by A. McMaster, J. H. Neff, Ben Anderson and Arley Martin "to collect damages from you and others associated with you in the destruction of the tent, piano and other personal property burned and destroyed at the Klan meeting held at the Town of Hudson on June 14." Twining also had the names of sixty other individuals who were involved in this matter. "Unless settlement of the damages is made within one week or some satisfactory arrangements made for a settlement, suit will be commenced against you and the others for the amount of $2000."[11] Initially, they did not give the letter serious consideration. But with Twining's arrival "for the purpose of getting evidence in the matter affairs took a new turn, and the parties concluded that he means business."[12]

William T. Doar, a New Richmond attorney, represented the defendants when the preliminary hearing opened at Hudson Court House.[13] William R. Kirk, District Attorney for St. Croix County, was the

prosecutor. J. H. Neff was the prosecution's chief witness. Neff, who swore out the original complaint, was the Klan organizer present at the tent affair.

Neff stated that he was the Grand Titan of the Fourth Province, Realm of Wisconsin, Knights of the Ku Klux Klan. Klan meetings had been held one week prior to the events of June 14. Advertisements for these meetings consisted of handbills distributed in that part of the state. He described the tent as being forty by one hundred twenty feet with plank seating and a platform twelve by twenty feet in size. Decorations consisted of American flags and bunting. There was also a player piano and Klan paraphernalia such as robes, signs and handbills.

That evening, the Klan meeting was scheduled to begin at eight thirty. At eight fifteen, said Neff, a large mob gathered at the gate and demanded to be admitted. Because the meeting was for Protestants only, the crowd was told that it could not enter. Also, since the grounds were rented, it would be illegal to do so. But the crowd advanced in a boisterous manner "stating that they were there to commit violence, stating to me that fact."

Neff said the crowd was excited, "and naturally they cursed me; they God-damned me, if that is admissable. I hate to say it, yet I must." He was "called other names; the tent was filled up to its full capacity of a howling, cursing—you couldn't hardly call it an audience—call it a mob." According to Neff, the Klansmen tried to defend themselves. Dr. Brown was taken to shelter. Neff said he then went to the platform and attempted to ameliorate the situation by a recitation of the Lord's Prayer and the singing of "America." This was met by jeers, cursing and general disturbance by the anti-Klan element. Neff explained that after telling the mob it was acting illegally, an attempt was made to explain the principles of the Klan; "but I was told that they did not want to hear anything about the Klan. They knew it all, but they wanted to know about those damn lies that had been told about the Roman Catholic Church." Neff, seeing that all was futile, said he was about to dismiss the meeting when Father Rice walked to the platform. Rice said he was representing several local priests and the Catholic people with the intention of protesting the meeting and driving the Klansmen out.[14]

Neff testified that he finally dismissed the meeting, but immediately saw several guns pointing at him. Neff then went to the back of the tent to the yells of "'kill him, lynch him, mob him; we want Pat Malone, where is he? Where is Dr. Brown? We want him; we want Neff!'" Neff said he managed to escape through the side of the tent to his car, after managing to hastily rebuke the crowd for its destruction. Then he and several of his associates drove to the Fillbach house where his wife and family were located. Neff said he remained at the house until he saw the tent in flames, at which point he drove to River Falls.[15]

Under questioning by attorney Doar, Neff maintained that he did not have an arrest record. Testifying that he had been connected with the Ku Klux Klan since 1922 when he joined the organization in Indiana, Neff said that he earned his living by working for them as an organizer. At first, Neff refused to divulge information about his wages and other interests in the Ku Klux Klan. Later, he stated that his income was four dollars per man enrolled, which funds came out of an initiation fee. As to whether his living depended on enrolling as many members as possible, Neff said that this was not the case since he was interested in building the Klan out of the best timber he could get, regardless of the commission he received. Still, it was his living.

Neff said that he had been connected with the entire province of the Ku Klux Klan for one year. Meetings had been conducted in the St. Croix Valley only during the two previous weeks and these had been at Northline. Prior to that, he had been in River Falls for a month. As the Grand Titan of Province Number Four, it was his job to supervise Klan activities in twenty-one counties, an area which included St. Croix County.

Pat Malone's affiliation with the Klan was only as a lecturer, as was Dr. Brown's. Only Protestants were admitted to the meetings because these were of a private, Protestant and invitational nature. Hence not all American citizens were permitted to attend.

Neff insisted that the uninvited crowd poured through the gate. As to Father Rice being recognized as a Catholic priest, the organizer stated that Rice introduced himself explaining that he was there on behalf of his colleagues and people. Neff said that he had no knowledge of an invitation being issued to a priest; that no charges were leveled against the priesthood; and that he never heard about any reflections being made against the Catholic Church, its priests, sisters and faithful, at least not at Northline. Neff admitted to hearing these accusations at River Falls. But the challenge to debate was issued to Father Fassbender by Pat Malone. Neff insisted that Father Rice was never challenged at Hudson.[16]

Father Peter Rice was the chief witness for the defense. Answering attorney Doar, Rice testified that he knew of the Klan meetings at Northline through the Klan placards he had seen displayed. In addition, he received anonymous letters from several places in the county, letters which had Pat Malone's picture on them. Contained in the letters were charges made against the morality of every Catholic priest in the county. These letters arrived after the first of the River Falls meetings.[17]

Rice testified that the substance of an earlier sermon was that "our Catholic people should protest, not by way of violence or physical force, but by pamphlets in writing and by requested permission to attend" Klan meetings. Klan members were to be asked whether "we could get a chance to refute their statements as to the moral character of the Catholic priesthood in general and the priests of the county in particular." As to the remarks made at the Catholic Guild meeting that Sunday afternoon, Rice told the ladies that they should defend the Sisters' and their honor by protesting in a dignified manner against individuals who saw fit to admit anti-Catholic lecturers within their home. Cathoic nuns were charged with being "the mistresses of Catholic priests." These statements were made at River Falls and at Northline, only with more inuendo.

Rice admitted attending the Klan meetings, but said that it was more a spur of the moment type of thing. Initially, he had no intention of doing so. If there were to be a debate, the priest expected that the confrontation would take place at Hudson. Rice went to the meeting at the request of Joe O'Connell and James McMahon. Also, the Klan had issued an invitation. "That was the sole reason I went, because I was a man and wouldn't back down where challenge was made." Rice said he went into the tent, quieted the people down, and asked Neff if he could say a. few words. Neff said "'certainly.'" He told Neff that "I had come out here in response to repeated challenges brought to me, conveyed to me, to refute or ask for proof of any charges against the morality of any Catholic priest in this county, any sister, or his housekeeper." Rice then told the people to keep quiet. Rice also told Neff that "I wanted proof given of any statement that any of the Klan members had to make against any Catholic priest in the county, to make it now." Neff, in a low tone, replied that none had been made.

Neff seemed to be a little excited at this juncture. Rice then said as a "Catholic priest I protest against being slandered or my brother priests being slandered. I did not say that they must be driven out." He had no intention to incite violence and denied any "literal expression that can be interpreted, legally, with intent toward physical force or disrupting their "meeting. After his speech Rice immediately went home.

As to the matter of the challenge, Rice testified that it was direct inasmuch as the placard issued at the River Falls meetings challenged Father Fassbender and other priests. It did not matter who authorized the placard as it was still the same organization.

Besides, "they would be alike in their dirty methods." With regard to the statements made at Northline, the Pastor said that he was informed "they were asking for the Catholic priest out there, people in Klan uniform." Several individuals yelled "'why don't you bring out your old priest.'" Rice said he ignored previous challenges. "But I thought I would back down before no man when he challenged my character." Kirk then asked whether Rice was directly attacked. Rice explained that a general attack was made against all Catholic priests in the county and the "fact that I was a priest in the county was a specific attack, because there are only five priests in the county."

Rice had no prior knowledge that there was to be a crowd of several hundred parishioners at Northline; although he had heard rumors that a Catholic crowd would be there. Even so, the purpose in going out was to defend the character of the Catholic priesthood and sisterhood. Rice also testified that he did not believe that his concern over the statements of the Ku Klux Klan would serve to influence his parishioners. He did not advocate physical violence and testified that "my Catholic people were instructed in church to avoid physical violence with anybody."

But he also told his parishioners "that when your Catholic priesthood is attacked and the honor of Catholic women and sisterhood, that you should answer back and ask for proof of the statements they were making." As to instructing the Ladies Guild to go down to Disney's, Rice said that "I did; pardon me, that is incomplete. On Sunday afternoon the 13th, I think," Rice suggested to the ladies that they visit these individuals and ask them "if it was their intent to insult their Catholic neighbors by keeping anti-Catholic lecturers in their home." He did not know that this was the Disney's only source of income. Rice did not want anyone put out. It was just to be a protest. As to whether harboring the Klan lecturers indicated the Disney's true feelings in the matter, Rice replied that "under the circumstances it would indicate at least sympathy." It was his belief that there existed no connection between the action of the Ladies Guild and the Klan tent burning. Under additional questioning, Rice said he did not rile up the Catholic men, but did impress upon them the necessity of upholding the honor of their women.

Kirk then asked Rice whether he gave advance notice that he would engage Klan leaders in debate. Rice explained that "I mentioned in a lecture given in the church to Catholics and non-Catholics earlier in the year, that I stood ready to meet at any place, any time, any anti-Catholic lecturer as long as" Rice was given a "fair show and fair hearing for debate. That was sometime in March, and I believe you were present in the Catholic church the same night Mr. Kirk, because I saw you."

Replying to defense attorney Doar's question relative to a printed challenge, Rice said that he had one in his possession which read as follows. "'As a rule I debate only with priests but due to the fact that Father Fassbender is too big a coward to meet me in open debate, I will be glad to meet your man Emil E. Holmes.'" As to the Pastor's feelings toward Hudson's Protestant community, Rice testified that "my experience generally is the Protestant people are as fine people as there is in America; I want no religious bigotry."[18] Thus was concluded the priest's testimony in the matter.

In his summation for the State, Kirk demanded that all defendants be bound over to the Circuit Court for trial. Rice was said to be morally responsible for the riot.[19] Doar, in a complete and total condemnation of the Klan, demanded that the cases be dismissed.[20] As County Judge, Arnquist was only empowered to determine whether the defendants should be turned over to the Circuit Court for trial.[21]

In arriving at his decision, Judge Arnquist issued a ringing denunciation of the Klan. Arnquist said it was "regrettable that any such organization should have come here. There is no question but that it tends to

make bitterness, strife and violence." There "have been a number of such movements in the past, and many of them created violence." One could not "blame Father Rice for being indignant at the charges of immorality made against him and the Catholic priesthood in Klan meetings." As such, Rice could not be condemned for "going to the Klan tent when told, through bad judgement, that he was invited there to defend himself against them."

Furthermore, said Arnquist, the "doctrines for which the Klan stand are well known, and are antagonistic to those of the Catholic Church," Because of this, and the charges made against him, Rice "was naturally against the Klan." As such, Rice "said in his church that a protest should be made against the charges." He had "no violence in his mind, only protection of the Church and himself from the charges." From this, noted the Judge, the "District Attorney has deduced a moral responsibility of Father Rice for the riot." Yet there was "no legal responsibility attaching to him, and that is what we are examining here. Therefore, it is my duty to discharge Father Rice."[22] Tony Lombard and George Hennesy were also acquitted.[23] Eleven remaining defendants were bound over for the Fall Term of the Circuit Court.[24]

In the aftermath of the hearing, the *Hammond News* noted that a great deal of feeling was being created over the incident. Many different stories were said to be circulating. These had gotten to be so out of proportion that it was getting difficult to obtain any accurate information on the happenings.[25] Feeling, observed the *Baldwin Bulletin,* was running rather high in Hudson. Sheriff Emerson was said to be taking precautions to prevent any reprisals that might occur. After the hearing was concluded, Klan members and sympathizers gathered to discuss Arnquist's decision. Those who sympathized with the defendants did the same.[26]

Hudson, noted the *New Richmond News,* was indeed getting plenty of publicity. Most of it, however, was of an undesirable nature. This Klan rumpus managed to push the town right onto the front page. Said the *News* of the publicity: "It reminds one of what the manager of a 10-20-30 show once said to this writer: 'I don't care whether you write us up or write us down, but great Scott, don't ignore us any longer!'"[27] Still, the end to the Klan tent affair had yet to be written.

In October, the *Woodville Times* noted that the Klan riot case was scheduled for the Fall Term of the Circuit Court. Yet there was some talk that this case might not be called. District Attorney Kirk, though, insisted that, if at all possible, he would bring the matter to trial.[28] In a succeeding issue, the *Times* said that the Klan riot case was not to be tried that Fall after all. Indeed, it was exceedingly doubtful that the case would ever come to trial. This was particularly so because "with the present evidence," or lack thereof, "no conviction could be secured," and Kirk did "not want to make a fizzle of it."[29] Thus the case was put over to the March Term.

In November, the County Claims Commission was approached with a claim for $1967 for the loss of the Klan tent. This was said to be the biggest item before the Claims Commission.[30] Members of this body, composed of N. E. Fraher, J. W. Hanley and Elmer Afdahl, dissallowed the claim. As to the reason for its action, the Commission stated that it was a matter for the courts to handle.[31]

Even so, the Klan tent affair did not reach the Circuit Court for the Spring Term of 1927. In the interest of a peaceful settlement of the issue, Spencer Haven appeared before the St. Croix County Board which convened a special session on Saturday, May 7. Haven said that the Catholics had subscribed five hundred dollars to this end. Various Hudson businessmen contributed a total of four hundred dollars. It was Haven's belief that if the County were to contribute five hundred dollars, the case would be settled out of court.[32]

Acceding to this request, the County Board charged this claim to the next year's

tax receipts.[33] One source noted that "the Klan will accept the $1400 in full for all damages and drop the suit, which was bothering a number of people quite badly."[34] The identity of the individuals who instigated the incident at Northline would remain a mystery. The Klan riot case was closed.

Finally, it is to be hoped that the lessons emanating from the social divisiveness, experienced not only by Hudson and other Wisconsin communities, but also similar localities throughout the land, have not been forgotten; and having remembered, citizens will not succumb to the irrational fear generated by such revitalized hate organizations.

Notes

[1] *St. Paul Dispatch* (St. Paul, Minnesota), June 15, 1926. In a postscript to the article, the *Dispatch* noted that Brown's remarks had been resented. Several days prior to the incident, a delegation of twenty-five Catholics went to the place where Brown was rooming with the demand that the landlady evict him. Brown volunteered to move to a different residence.

[2] *New Richmond News* (New Richmond, Wisconsin) June 16, 1926.

[3] Spring Valley *Sun* (Spring Valley, Wisconsin), June 17, 1926.

[4] *New Richmond News*, June 23, 1926.

[5] Spring Valley *Sun,* June 24, 1926.

[6] *St. Paul Dispatch,* June 28, 1926.

[7] *St. Paul Pioneer Press* (St. Paul, Minnesota), June 29, 1926. Twining was one of three signers of the Articles of Incorporation, Knights of the Ku Klux Klan, Realm of Wisconsin.

[8] *St. Paul Dispatch,* June 29, 1926.

[9] *New Richmond News,* June 30, 1926.

[10] *Hudson Star Observer* (Hudson, Wisconsin), July 1, 1926.

[11] *New Richmond News,* June 20, 1926.

[12] *New Richmond News,* June 30, 1926.

[13] The fourteen defendants were: Alex Lomnes, William Burton, Jr., Edward Christoph, Robert O'Rourke, Father Peter Rice, Gregg Busby, Henry Zorn, Mrs. Joe Miller, Tony Lombard, Henry Klein, George Hennessey, Harry Kinney, Eugene Ritchey and Tony Muchie.

[14] Testimony of J. H. Neff, State of Wisconsin *v.* Alex Lomnes, *et al,* June 28-29, 1926, File Number 9506, St. Croix County Court House, Hudson, Wisconsin (hereafter cited as Preliminary Hearing), pp. 1-4. Father Rice was present on behalf of Father Fassbender of River Falls and Father Shanaghy of Ellsworth.

[15] Testimony of J. H. Neff, Preliminary Hearing, p. 5. The Fillbach's were the people who rented part of their acreage to the Klan.

[16] Testimony of J. H. Neff, Preliminary Hearing, pp. 7-15. It should be noted that Pat Malone, whose headquarters was at Chetek, Wisconsin, was a circuit lecturer for the Klan in Wisconsin. Anti-Catholic and one hundred percent American in approach, Malone was a big drawing card at Klan gatherings. Interestingly enough, Malone was not a member of the Klan. Prior to working for the hooded order as a lecturer, Malone rode the anti-Catholic lecture circuit causing community dissension, disruption and acrimony in such diverse areas as Elm Creek, Nebraska and Oakland, California.

[17] Testimony of Father Peter Rice, Preliminary Hearing, p. 78. Of interest here is that Rod Chinook, owner of a River Falls printing shop, printed a large amount of the Klan's propaganda. This material was used for the River Falls and Northline campaigns.

[18] Testimony of Father Peter Rice, Preliminary Hearing, pp. 79-89. It should be noted that the Klan were mistaken in their belief that Holmes was a Catholic representative. Holmes, president of the World War Veterans Association, located in Minneapolis, Minnesota, debated on his own account with Pat Malone at River Falls in April 1926.

[19] *Baldwin Bulletin* (Baldwin, Wisconsin), July 2, 1926.

[20] *St. Paul Pioneer Press,* June 30, 1926.

[21] *St. Paul Dispatch,* June 29, 1926.

[22] *Baldwin Bulletin,* July 2, 1926.

[23] *New Richmond News,* June 30, 1926.

[24] *Hudson Star Observer,* July 1, 1926.

[25] *Hammond News* (Hammond, Wisconsin), July 1, 1926.

[26] *Baldwin Bulletin,* July 2, 1926.

[27] *New Richmond News,* June 30, 1926.

[28] *Woodville Times* (Woodville, Wisconsin), October 1, 1926.

[29] *Woodville Times,* October 8, 1926.

[30] *Baldwin Bulletin,* November 26, 1926.

[31] *New Richmond News,* November 26, 1926.

[32] *Hudson Star Observer,* May 12, 1927.

[33] St. Croix County Board Proceedings, Special Session, St. Croix County Court House, Hudson, Wisconsin, May 7, 1927, 055/1/2, Area Research Center, Chalmer-Davee Library, University of Wisconsin, River Falls, Wisconsin, VII, p. 66.

[34] *Woodville Times,* May 11, 1927.

THE CHANGING *COMPADRAZGO* IN THE UNITED STATES

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INTRODUCTION

This essay will examine the way in which the *compadrazgo* mechanism presently operates in the United States as compared to its older form in Old Mexico. We will discuss the *compadre* system in terms of its basic structure as well as its functional relationships to various aspects of culture, such as the family, the status system, and the role of the individual in culture.

The *compadrazgo* as it exists in the New World is a ritual phenomenon which designates a particular set of complex relationships which are set up between those individuals who participate in the ritual of a Roman Catholic Baptism. This term is also used to indicate those similar sets of relationships which are set up when discussing the *compadre* mechanism as it is applied to the Catholic rituals of confirmation and marriage. When applicable, we will borrow Mintz and Wolf's use of the term "horizontal" to designate the direction which the *compadre* mechanism takes when linking together members of the same social class, and also, the use of their term "vertical" to indicate the direction that this mechanism takes when linking members of different socio-economic and socio-cultural classes.

BASIC STRUCTURE AND TERMINOLOGY

In the main, this religiously based rite—*compadrazgo* (ritual kinship) involves three individuals or groups of individuals, depending on the type of Roman Catholic rite taking place. The basic participants in this ritual are: one, an initiate who is a child, as in the baptismal rite (although the initiate may be an adolescent and in rare cases, an adult); two, the biological parents of the initiate; three, the sponsors of the initiate. The *compadrazgo* or co-parenthood thus, generally involves three sets of relationships: The first set links the parents and the child; the second set links the child and his ceremonial sponsors; and the third set links the biological parents of the child to his ceremonial sponsors. The ceremonial sponsors of the child at baptism are known as *padrinos de bautismo* or *padrinos de pila* (godparents). The baptized child (godchild) is thus addressed as *ahijado* (male) or *ahijada* (female). The godchild addresses his sponsors as *madrina* or *nina* (female) and *padrino* or *nino* (male). The relationship between godparents (*padrinos*) and godchild (*ahijado* (a)) is known as the *padrinazgo*. The relationship between the child's sponsors (*padrinos*) and his real parents is known as the *compadrazgo* or co-parenthood. Both the child's sponsors and his parents generally address each other as *compadres,* and in the singular, *comadre* (female) and *compadre* (male). These terms are also used to indicate similar sets of relationships when discussing the *compadrazgo* as it is applied to the rituals of first communion, confirmation and marriage.

Field data for this paper were gathered from 1976 to the ethnographic present, May 1984. I selected these interviews out of twenty others dealing with Mexican-American (Chicano) culture and society; these are on ten, one hour tapes. I believe that they best represent the ongoing changes in the *compadrazgo* system among Mexican-Americans (Chicanos) in the United States. I have used the terms Mexican-American and Chicano relative to the way the people (respondents) see themselves.

Portions of this study were presented in a folklore conference (II Mesa Redonda De Folklore Y Ethnomusicologia) in Mexico City, Summer of 1983.

For a detailed discussion on the structure and function of the *compadrazgo* in Meso-America see: Paul 1942; Mintz and Wolf 1950; Foster 1953; Sayres 1956; Ravicz 1967; Nutini and White 1977; and in the United States, Spicer 1940.

Historical Development

Various writers have speculated on the background of the *compadrazgo's* New World development—debating whether its main influence came from Europe, the American Indian, or Criollo culture (Mintz and Wolf: 342). But in order to best understand the importance of the *compadrazgo's* changes in the Americas, more especially in the United States, it is necessary to understand its early development in Europe.

Although the basic form of the New World *compadrazgo* had its chief antecedents in Spain, the concept and practice of co-parenthood was also known across medieval Europe. In fact, in the early days of Christian persecution a system of requiring sponsors for new converts was established to avoid the admission of untrustworthy individuals into the cult (Mintz and Wolf: 343). Sponsors of new Christian converts came to be viewed as spiritual parents or godparents. Subsequently, the ritual practice of co-parenthood went through various stages of development in Spain and Europe.

Ritual co-parenthood received its primary established overt recognition when the Roman Catholic Church required that all infants be baptised. This ritual act was viewed as a spiritual rebirth, the sponsor being spiritually bound to the new member. The biblical scholar, Jeremeas contends, however, that infant baptism was in practice before the church made it mandatory in the Fourth Century (Gudeman: 228). During this historic period, required sponsorship for the godchild went through several major changes. At first, it was required that an outsider be the ritual sponsor, then it became a custom for the parents of the child to be his sponsor. This practice became so entrenched that by A.D. 408, Bishop Boniface believed that parents were required to sponsor their own children. Saint Augustine (A.D. 345-430), however, disagreed with this point of view. He called the Bishop's attention to the fact that because slaves, orphans and deserted children could not be sponsored by their parents, it was necessary to make exceptions to this custom, thus permitting non-parents to be the ritual sponsors of these familyless people (Gudeman: 228-229).

During the fifth century individuals revived the initial custom of having non-parents serve as the ritual sponsors for an infant's baptism. This custom grew out of the belief that a special spiritual relationship was established between the sponsor and the godchild. Furthermore, by choosing outside individuals to sponsor a child, people began making the clear distinction between the natural parents and the spiritual ones. The Roman Catholic Church in A.D. 813, recognized and reinforced this idea of a spiritual relationship; moreover, it issued an edict which forbade parents to be their children's ritual sponsors (Gudeman: 231; Mintz and Wolf: 344). In addition, from 900 to 1300 A.D., ritual co-parenthood relations became vertical between serfs and their lords (Mintz and Wolf: 364). Thus, mutual aid agreements between feudal lords and their vassals were strengthened through the *compadrazgo* system.

During the sixteenth century the Spanish essentially conquered the New World, and as a result established a *compadrazgo* system, similar to that of the feudal period, between the conqueror's and their Indian subjects. Each Spanish conqueror was obligated to have all the Indians under his jurisdiction Christianized. Therefore, to facilitate the conversion of the Indians, the Spanish rulers introduced their *compadrazgo* system.

Since little is known of the development of the *compadrazgo* in Old Mexico following the Spanish conquest it is appropriate to note the views of the following Middle American scholars. According to George

Foster (1953:24), the Indians were not only receptive to the Spanish *compadrazgo* because it was similar to their indigenous practices (i.e., the notions of spiritual rebirth and spiritual kinship were not contradictory to Indian beliefs), but they also developed it into a more complex system than that in Europe. Horstman and Kurtz, however, believe that the conquered Indian society readily accepted the Spaniard's introduction of the *compadrazgo* system because of their post-conquest condition, one permeated with grief and stress (Horstman and Kurtz: 361). The institution of ritual co-parenthood, then, was a vehicle which these native cultures could utilize in their efforts to regroup as a viable force under the dominance of their Spanish rulers. It can thus be hypothesized that it is this nationalistic impulse which the Mexican-Americans (Chicanos) have institutionalized in their practice of the *compadrazgo* in the United States. In other words, these acculturating Mexican-Americans have experienced conditions under the Anglo-Americans similar to those experienced by their ancestors under Spanish rule. It can be argued that the *compadrazgo* system serves the Mexican-Americans (Chicanos) as a viable adaptive mechanism for coping with stressful conditions in American society. It is also quite probable that the *compadrazgo,* as an institution, has persisted in Mexican-American (Chicano) culture because of its superior adaptive ability, especially in terms of the wide choices it offers this ethnic minority group in establishing interpersonal relationships. As a result of making strategic choices in their selection of *compadres,* these people are able to establish internal (horizontal) ties as well as vertical ties with fellow Mexican-Americans (Chicanos) who have achieved a higher socio-economic level in Anglo-American society. This practice, then, assists them to survive as an identifiable society. With the aid of the following studies as well as my field interviews, we can better understand how the Mexican-American (Chicanos) utilize the practice of the flexible *compadrazgo* system in their efforts to adjust to stressful conditions in Anglo-American society.

Compradrazgo and Adaptation in Twentieth Century U.S.A.

For comparative purposes it is appropriate to review both Madsen's and Rubel's descriptions of the *compadrazgo* among rural Mexican-Americans in South Texas as well as Carlos' and Thurston's data on the use of ritual co-parenthood by urban Mexican-Americans.

In South Texas the ceremonies for which ritual sponsors are selected are baptism, confirmation and marriage (Madsen: 49; Rubel: 80-83). Madsen states that it is also an accepted practice for the baptism godparents to serve as the confirmation godparents. In order of importance, godparents of baptism come first, then those for confirmation. By comparison, godparents of marriage rank last, and in a sense, are considered insignificant (Madsen: 49).

Mexican-Americans of South Texas seek *compadres* who have the following qualities: honorable, goodhearted and respected in the community. In keeping with this value system, it is considered bad taste to select godparents who are of a higher socio-economic status. Within this esoteric community, such a choice would suggest that the selecting party is interested in rising above the socio-economic status of his neighbors. More and more, it is becoming a common practice for these people to select *compadres* from their blood kin, such as uncles and aunts. These people believe that it is wise to select *compadres* who are biological relatives because they are less likely to leave the community and thus not fulfill their ritual obligations as godparents. Choosing *compadres* who are blood relatives not only strengthens the bonds of the family but it helps to preserve the group's identity in the face of increasing anglicization (Madson: 49).

Relationships between Mexican-American

compadres are dignified and formal. Therefore, it is only proper for these co-parents to address each other in the Spanish formal term, "usted," rather than with the informal pronoun, "tu." *Compadres* are never to joke or gossip about each other. Within this socio-religious system, it is expected that *compadres* will visit each other at regular intervals and cultivate close relationships. In times of great need, *compadres* may exercise their right to call upon each other for aid and advice (Madsen: 49; Rubel: 82-83). By comparison, Mexican-Americans in rural South Texas, have a complementary system of exchange which is similar to but not as formal as the system of exchange that characterizes the Tzintzuntzan *compadrazgo* in Old Mexico (See, Foster; 1967: 75-85).

According to Rubel, not only is formal behavior a custom between Mexican-American *compadres* in rural South Texas, but the incest taboo also applies to their ritual relationships, similar to those among the Tzintzuntzenos of Old Mexico. Rubel states that one of his informants told him that if a man fears that his friend may sleep with his wife, he makes him his *compadre* (Rubel: 80; Foster: 79). Nevertheless, the most important characteristics of co-paternity among rural Mexican-Americans of South Texas are its combined reciprocal ritualized obligations between *compadres* with additional privileges of mutual aid.

Some researchers, such as Carlos, claim that there is little difference between rural and urban use of the *compadrazgo* among Mexican-Americans (Carlos: 476). Moreover, Carlos and Thurston found that urban Mexican-Americans are very interested in maintaining the *compadrazgo* system (Carlos: 477; Thurston: 51). Thurston's study of a Los Angeles barrio shows that a significant percentage (75%) of young women from this area are in favor of perpetuating the *compadrazgo*. He, however, suggests that the *compadragzo* has been devalued among Mexican-Americans, especially among the young. Grebler, Moor and Guzman, support Thurston's point of view (Thurston: 46-52; Grebler, Moore and Guzman: 354-355). Manuel Carlos disagrees with these writers. He contends that the *compradrazgo* is valued by urban Mexican-Americans, pointing out that welfare programs, voluntary associations and pressures for acculturation have not significantly changed the Mexican-American's reliance on family ties or fictive kinship for mutual aid (Carlos: 477). What has been asserted to be a devaluation of the *compadrazgo* among Mexican-Americans is more of a change in the formality of structuring the *compadres'* interrelationships.

Thurston states that urban Mexican-Americans choose sponsors for baptism, first holy communion, confirmation and marriage. According to his study of a Los Angeles barrio in 1957, Mexican-Americans believed that, ideally, non-relatives should be selected as Godparents (Thurston: 46). He notes, however, as did Madsen in his study of the rural *compadrazgo,* that there is a growing tendency for urban Mexican-Americans to select blood relatives as *compadres.* They believe that blood kin are more reliable and less likely to leave the Los Angeles area; thus, more likely to live up to their obligations as godparents and responsible *compadres* (Thurston: 46; Madsen: 49). Furthermore, it is evident that some young urban Mexican-Americans either select *compadres* who have prestige in the community or from those associates who are fellow workers. In addition to Thurston's and Madsen's data, Carlos' more recent information reveals that urban Mexican-Americans prefer relatives or intimate friends as ritual godparents, that relatives are selected more frequently than friends (Carlos: 477-478).

Selective Geographical Interviews in the U.S.A.

The following interviews represent selective, socio-cultural views of the *compadrazgo* system as practiced by

Mexican-Americans (Chicanos) residing in cities and small towns in the United States. In the main, their comments reflect the various forms of stress they experienced while in the process of acculturating to middle class Anglo-American society. G.M.'s godparents are of blood kin; his *padrino* is his father's brother and his *madrina* is the wife of his father's brother. Both families immigrated from Old Mexico to the United States, first his godparent's family and then his family. G.M. said "my father and his brother are compadres, they think of each other as compadres and then as brothers." G.M. related that, unfortunately, there was little contact with his godparents because they, unlike his family who settled in Milwaukee, Wisconsin, never settled in one place for they were constantly part of the stream of Mexican-American migrant farm workers.

With regard to co-parenthood relationships, G.M. believes that it is very common for isolated immigrant families, such as his, who settled in the Milwaukee area, to confine the selection of godparents, especially of baptism, to members within the extended family. G.M. is the godfather of his brother's son, and another brother is godfather to G.M.'s daughter. These brothers, however, unlike the formal relationship between his father and godfather (his uncle), think of each other first as brothers and address each other by name, seldom addressing each other as *compadres.* G.M. stated "I guess it feels strange for my brothers and I, here in the United States, to address each other as compadres." It is safe to assume that this change of formal relationships is due to their exposure to the norms of Anglo-American society which does not have or understand the *compadrazgo* mechanism.

G.M. and his brothers (*compradres*) realize that their socio-cultural milieu is different from that of their cousins in Old Mexico. G.M. states "our relatives in Monterey (Nuevo Leon, Old Mexico) live among the people. When they become co-parents in a baptism or for confirmation or in a marriage, their relationships are very formal with the child and his parents. They (the godparents and child's parents) address each other as compadres and comadres. These compadres look upon each other with great respect and reverence." G.M. said that this formal attitude is present in the relationships between godparents and their godchildren. The godchildren refer to their godparents as *madrina* and *padrino,* and the godparents address their godchildren as either *ahijada* or *ahijado.* All the members of this Mexican *compadrazgo* employ such forms of address very seriously for they consider these ritual relationships as part of a sacred pact with God. By comparison, G.M. states "In the United States, within my own family the practice of the compadres is different than that of my (Mexican) cousins. Even though my wife is a Catholic, she is of an Anglo background. Among her people there isn't that concept of compadrazgo (ritual co-parenthood) but they do believe in having godparents for a child's baptism." Thus, when the time came to select co-parents for their daughter, they chose one from each side of the family; one Anglo-American, and one Mexican-American. G.M. said that the reason for this dual selection was to keep peace in the family. He said "it works." The manner of reference between parents and godparents is not formal, each addressing the other by first name.

The next interview was with a third generation Mexican-American (Chicano) who was from Brown, Texas but now resides in LaCrosse, Wisconsin. D.C. states "My relationship to my compadres (godparents of his children) is one of friendship, but it is not ritualistic. For Chicanos, I think, the ritual aspect of the compadre has died. They are not Mexicans like the people from Old Mexico; they are Chicanos who are born in the States. With my father and his compadres (second and third generation Mexican-Americans), they were more than friends, but it wasn't a formal relationship. With my

grandfather, however, it was a different case. He used the term compadre in a ritualistic way, with great respect and reverence."

D.C. said that there was a great difference between his grandfather's idea and practice of the *compadrazgo* and that of his parents. Among godparents and parents (*compadres*) there was always great respect for each other. These ritual co-parents, especially of a baptised child, could trust and count on each other in times of need, i.e., *compadres* and *comadres* could always count on each other's help. D.C. stated "Favors were always fulfilled between Mexican godfathers; then a promise was a promise to your compadre."

D.C. said that within his grandfather's generation, both in Old Mexico as well as in the United States, it was always considered a great occasion when godparents came to the child's house for a visit, especially if they were his baptismal sponsors. When the men got together (*compadres*), it was a call for a great festive celebration. The women of the house (wife, mother, and sisters) were expected to cook a meal for their *comadres.* D.C. stated "I think there was a lot of tribal attitudes present in the old traditional compadrazgo, something which is not present or seen today in the United States." It was evident, from further conversation with D.C., that the *compadrazgo* tradition and practices among second and third generation Mexican-Americans have been diminished or repressed as a result of their efforts to cope with American society.

D.C. stated that his baptismal godparents had not been selected from blood relatives. "They were just people who my parents met at church. In those days there were few places where Mexicans could socialize; they were a segregated group in Brown, Texas (a small town outside of Dallas)." For his confirmation an uncle and aunt served as his sponsors (godparents).

D.C.'s parents remained in Brown, Texas, staying in the same low income, socio-economic strata as most of the Mexican-Americans of their age group. His godparents of baptism, however, like a few other Texas, Mexican-American families, either entered the stream of migrant labor or permanently moved from Texas. D.C. said that he left his father's community so that he could get an education and gain higher socio-economic status. Now, as a college-educated man who married an Anglo-American woman, D.C. feels that he is an assimilated Mexican-American. He stated "I could not compare my Chicano culture to that of my grandfather's. My compadres, the godparents of my children, are Mexican-Americans. We address each other as compadres but we are only friends, compadre friends. We are not compadres of blood relation, and we don't maintain the formal practices of the compadrazgo as my grandfather did. We are Chicanos who have developed a different culture."

Mrs. H.S., from Grand Junction, Colorado presents another view of the practice of the *compadrazgo* among Mexican-Americans. The *compadres* of her parents, the ones who baptized her, are her father's sister and her husband. Mrs. H.S. stated "I always think of my aunt as my madrina and her husband as my padrino." Her parents and godparents always address each other as *compadres.* She emphasized that in her tradition (of an Old Mexican background), *compadres* remain as such for the rest of their lives, regardless of their blood ties or even divorce. Furthermore, when uncles or aunts, in her *compadrazgo* system, become godparents or *compadres,* the blood cousins automatically become more than blood relation. These cousins become known to each other as "hermanas or hermanos de pila." She also stated "If your brother(s) or sister(s) become the godparents of your children, then the tradition is that you should address them as your compadres. But if your parents baptize your children, then, even though they are your compadres, one must never address them as such. One must always refer to them as father or mother."

After further conversation with Mrs. H.S., it was evident that members of her nuclear and extended family not only identify with Old Mexican society and culture but they maintain its particular form of the *compadrazgo system.* The reason they adhere to and support the practice of selecting their parents as godparents for their children is because it helps strengthen the son-in-law and mother-in-law relationship, as well as the father-in-law and daughter-in-law relationship. This esoteric group also believes that because they maintain this practice there is less possibility that any one of the in-laws, on either side of the family, will commit incest with a son-in-law or a daughter-in-law. It is considered more sinful and sacreligious to break this incest taboo than if one of the in-laws or one of the married couple had extra-marital relations outside of their extended family. This group's practice of the incest taboo is similar to that cited by Rubel in South Texas or Foster in Old Mexico.

The values and respect for the *compadrazgo* pact, especially between *compadres* of baptism, is further exemplified in the following belief and practice. Mr. H.S. stated "when two compadres get mad at each other and they can no longer stand their anger, finding it necessary to fight, they throw their hats into the air and ask God's permission to fight; then they fight." According to Mrs. H.S., this custom must be adhered to in order not to offend God and thus maintain their belief in the sacredness of the *compadrazgo.*

In an interview with E.V. from Laramie, Wyoming, it is evident that young Chicanos still believe in and maintain the *compadrazgo* mechanism. He stated "I feel very close to my godchild (male) and he always calls me his nino. They (his parents) say that that is all he talks about, is his nino. I believe that I would be responsible for his spiritual and even general upbringing, that is, if his parents should pass away or they were seriously injured and "unable to raise him." E.V. visits his godchild every opportunity he gets, and takes him a present on his birthday.

The baptismal co-sponsors for the above godchild are the parent's best friend (E.V.) and the initiate's aunt on his mother's side of the family. E.V. speaks to his co-parents in English and addresses them by their first names but they answer him in Spanish and address him as their *compadre.* E.V. says that when he gets married (within a year of the interview) he will ask his "favorite cousin" (a second cousin) to be his sponsor (*padrino,* the best man) and his fianceé is going to ask her first cousin to be her sponsor (*madrina,* the maid of honor). The ring bearer is going to be her aunt's son on her father's side of the family. E.V. intends to have his children sponsored at baptism either by one of his brothers or his wife's brothers and their wives. His rationale for this selection is mainly to keep the *compadrazgo* relationships within the family, thus, they can be counted on to raise his children if something should happen to him and his wife, especially, in case of the death of both of them. In addition, speaking for himself and on behalf of his future wife, E.V. believes that in order of rank, *compadres* of baptism are the most important because they have the greatest responsibility to the growing child. Selecting *compadres* from any particular socio-economic level was not important to him, what counted was the child's spiritual upbringing. The sponsors for confirmation and marriage are secondary to those of baptism, especially for marriage because by that time the individual is grown and has learned the important spiritual way of life as well as proper social behavior. E.V. believes that the selection of *compadres* from blood kin also strengthens the bonds of the extended family. Finally, based on further discussion with E.V., it is clear that his views of the *compadrazgo* system reflect those of his immediate and extended family and friends who migrated to Wyoming from north central New Mexico.

Our final view on the practice of the *compadrazgo* in the United States comes from Nancy Ortiz. In 1976 she interviewed five urban Chicanos from central California. Her data reveals that: first, in every case, parents selected the baptismal godparents; three were not blood kin. Second, they maintain a sense of obligation and respect for their godparents. Third, all of them believe that relatives make better godparents than outsiders, because they are more dependable and tend not to move away. Even when they leave the community, they keep in touch with the *compadres* and will travel a long distance to see their godchildren. Fourth, all five respondents stated that it was preferable to select godparents who are relatives, for not only are they viewed as very special, more than those outside of the immediate family, but they strengthen blood kinship bonds. This view is in agreement with those of Mrs. H.S. of Colorado and E.V. of Wyoming. Fifth, all of the five Chicanos agreed that they would come to the aid of their godparents if they were in trouble. Finally, all of Ortiz's respondents believed that godparents are responsible for the care of the spiritual and physical needs of their godchildren in the event that the parents can not. (Ortiz, 1976) Both of these points of view are similar to all of the above cited interviews and studies of the *compadrazgo* system among Mexican-Americans (Chicanos) in the United States.

Analysis and Conclusion

Based on the foregoing studies and interviews, it is evident that Mexican-Americans and Chicanos, from both rural and urban settings, have an understanding of the *compadrazgo* mechanism, thus maintaining and perpetuating its beliefs and practices. These people, however, have experienced great pressure in acculturating to middle class Anglo-American society. This process has affected changes in the *compadrazgo* system. When married couples are outside of their traditional community and away from the extended family, they tend to select godparents from among other Mexican-American (Chicanos). And once the individual moves away from the esoteric community and out of the influence of the extended family, he acquires ways of the dominant society through social and cultural contact. In other words, in seeking upward mobility in both social and economic stratifications, they tend to choose Mexican-American (Chicano) godparents who are friends and not blood kin. Another ramification related to seeking upward mobility by first, second, and third generation Mexican-Americans is that acquiring degrees in higher education and positions in professional fields leads to both friendships as well as intermarriage with Anglo-American people, most frequently marriage with Anglo-American women. In other words, due to cultural contact and the upward movement in socio-economic status, these Mexican-Americans (Chicanos) find there are very few of their own to associate with, especially to date or marry. To fulfill these needs they acquire both Anglo-American friends as well as spouse from among their college peers and working milieu. In a case of intermarriage, *compadres* are selected from both Mexican (Chicano) and Anglo-American Catholic families, even though the two have different concepts, beliefs and practices with regard to godparents or co-parenthood. Moreover, the *compadrazgo* mechanism, though it operates on a less formal level, helps strengthen family ties for members of the Mexican-American (Chicano) family who have acquired afinal relatives through marriage.

The differences between the Old Mexican peoples' use and the Mexican-Americans' (Chicanos') use of the *compadrazgo* system may be explained, in part, by the different socio-economic conditions they experience. Mexican-Americans and Chicanos, like the people of Tzintzuntzan, do not adhere strictly to the Roman Catholic church's rules

regarding ritual co-parenthood. Some have the same individuals for godparents in two or more ceremonies. All of them extend the spiritual relationship to include the parents of the child and the sponsors as ritually related. In addition, the *compadrazgo* for Mexican-Americans and Chicanos may be seen as a more intimate relationship reserved for relatives and close friends. Moreover, the informality between urban Mexican-Americans and Chicanos and their *compadres* is related to their contact with Anglo-American society which practices less stress on formality, i.e., people who are close express their intimacy by addressing each other by their first name. It is thus not surprising that urban Mexican-Americans and Chicanos drop the formalities within the *compadrazgo* relationships. But it would be an error to view this informality as a devaluation of the *compadrazgo* mechanism. It is as revered by Mexican-Americans as it is by Foster's Tzintzuntzenos. Both cultures observe the incest taboos between sponsors and godchildren and between *compadres* and members of the extended family. As in the Old Mexican traditions, Mexican-Americans and Chicanos have adapted the *compadrazgo* system to fit their changing needs and life styles.

Finally, it would be unrealistic to state that a generally established pattern has evolved for either the horizontal or the vertical selection of *compadres* by members of the various groups of Mexican-Americans and Chicanos, especially within the last quarter of this century. The reason for this diversity of practice is that not only have a sizable number of Mexican-Americans and Chicanos entered middle class Anglo-American society, but more of these people are breaking out of the manual labor and blue collar worker's socio-economic class, and into the professional world with its more sophisticated socio-political class structure. In essence, by becoming skilled workers, and acquiring better educations contemporary Mexican-Ameicans and Chicanos are becoming more mobile. It is this phenomenon of upward mobility which has had a direct affect on the nature of the *compadrazgo* system in the United States. There is no doubt, however, that the *compadrazgo* is a viable institution which is part of an ongoing, progressive Mexican-American (Chicano) society and culture.

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RESPONDENTS

D.C., 1977, La Cross, Wisconsin, age 27 B.A. and M.A. in Counciling, third generation Chicano (Mexican-American).

E.V., 1984, Laramie, Wyoming, age 27, B.S. in Biology.

G.M., 1976, Milwaukee, Wisconsin, age 30 B.A. and M.A. in Counciling, naturalized citizen.

Mrs. H.S., 1979, Grand Junction, Colorado, age 59, high school education, housewife.

FROM ARC LIGHTS TO GIGAWATTS FOR WESTERN WISCONSIN

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One hundred ten years ago man had for light at night and in dark places only the flaring gas jet and the kerosene lamp. These were better than the tallow candles and whale oil lamps they had replaced but they were still dim, inconvenient and dangerous, and a new source of light was needed by an increasingly technological society.

The Chinese of a thousand years ago used magnetism for the compass and Benjamin Franklin was a leading expert on the phenomena of static electricity. In 1789 Volta invented the battery which would provide electric current for Davy's arc and incandescent lights, for Davenport's electric motor and for Morse's telegraph. In the 1830's Michael Faraday combined magnetism and electricity in building the all-important generator which would turn mechanical energy into electric energy in any quantity desired. These men were scientists who pursued their studies for the love of them. Their discoveries were used by more practical men to complete the industrial revolution and to change the way of life of the civilized world.

By the 1870's Brush had developed the series connected electric arc but its sputtering glaring light was suitable only for streets or large places. Edison who, after several successful inventions, was looking for new opportunities immediately saw the enormous possibilities in home and general electric lighting. By 1879 he had invented the high resistance low current incandescent light bulbs to be connected in parallel in a low voltage circuit. On September 4, 1882, his Pearl Street Station became the first central electric generating station in the world. On September 30, the Appleton, Wisconsin generating station was turned on as the second Edison central generating station and the first in the world to use hydropower as its primary source of energy. The Edison direct current circuits limited the size of systems and especially the distances between generators and loads. By 1886 George Westinghouse, and his engineers had worked out a system for generating, transmitting and using alternating current which enormously extended these limits. After his brilliant success in lighting the 1893 Chicago World's Fair and a bitter battle with Edison and his General Electric Company, in 1896 the two companies adopted a compromise of 110 volt, 60 cycles per second, alternating current for distribution systems.

Within a few years nearly every Wisconsin community of more than a few hundred residents had one or more supplies of electricity. These were often called Electric Light Companies or Electric Light and Traction Companies as the combination of electric lighting at night and electric streetcars and interurbans during the day seemed a good way to get full use from the central generating equipment. The primary sources of energy were water power where available, coal fired reciprocating steam engines and, in later years, steam turbines and ponderous oil burning diesels. Service was erratic, often intermittent, and was limited to city residents or even to parts of cities. As the years passed, the quality of the service rapidly improved and the areas were increased, but only the most far-sighted of those early entrepreneurs ever imagined great electrical networks with connection available to almost every building in Wisconsin.

This is not surprising because growth was

characterized by confusion, uncertainty, and almost yearly corporate change. Three classes of men transplanted electric plants from the greenhouses of the inventors to the cities and villages where they could grow: Manufacturers and salesmen, city and village fathers who saw electric lights as a desirable civic improvement; and less often, men who saw central stations as a business with a great future. At least thirty years passed before the electrical generating business in Wisconsin could be called reasonably stable and financially successful. It is interesting to summarize some of the reasons why that time was so long.

First the whole field was new and there was little outside or previous experience to draw upon. The equipment salesmen and city fathers were often more interested in getting the generation and distribution of electricity started than in establishing a stable industry which could grow and expand appropriately with the passing of time. Others saw lighting and traction companies as a quick way to make money and this was almost never true. Second, the combination of lighting and traction which seemed so attractive did not work out well. Few of the street car and interurban lines were ever profitable and the lighting part of the enterprise, which might have done well by itself, was financially unable to support both. Eventually the traction companies were separated and nearly all had quietly discontinued business by the end of WW II. A third reason was that the whole technology was new. Companies which were well managed and well engineered for the time had also to be almost lucky to be able to select good equipment for their particular installations and even then would find, in a few months or years, that it had been made obsolete by rapid technical developments. Finally, there was a fourth factor which had at least as great effect as any of the others then and is just as important today. It was that there is a great increase of economy with size in an electric generation and distribution system. An electric company must be big enough to efficiently utilize its management, its engineering services, its installation and maintenance services, its accounting and financial functions, and especially its generation and distribution facilities. This was recognized by the more astute in the industry as soon as technology made growth, area expansion, and interconnection possible. When appropriate levels of these had been achieved by various companies, electrical generation and distribution became profitable and service could be improved and extended in an orderly manner.

By 1882 there were eight arc lighting systems in Wisconsin, and Eau Claire was the first city in the state to have competing hydroelectric arc lighting companies. The Eau Claire Brush Electric Company was an immediate financial success and in 1885 became the first in the state to earn and pay common stock dividends and continued to do so for the next five years. The competing company gave only irregular service and by 1888 had been absorbed by the Brush Company. By this time a horse-powered street railway was in operation and in 1890 the three companies were merged into the Eau Claire Street Railway, Light and Power Company. The company went into incandescent lighting, electrified the railway and began to fail financially almost from its inception. When it went into receivership in 1896, it was acquired by A. E. Appleyard who, after some manipulations, combined it with the Chippewa Falls Water Works and Lighting Company, which had built an interurban line to Eau Claire into a successful operation called the Chippewa Valley Electric Railway and Light Company. Then in 1905 Appleyard suddenly and somewhat mysteriously sold out to a group of purchasers headed by the Ingram, Knapp and Stout lumber families.

The new owners, like most, directed their efforts towards hydroelectric power development, but unlike most, they used good judgement in so doing. A lease for the 650 horsepower output of the Eau Claire Dells Dam provided the principal source of energy

for the Chippewa Valley Company. The Knapp-Stout interests also owned the lighting plant in Menomonie and supplied it from the hydro plant at their lumber mill on the Red Cedar River. They planned to expand from these two bases until the potentials of both the Chippewa River and the Red Cedar were fully utilized but they were also fully aware of the vagaries of these rivers, developed relatively small hydro sites, one at a time, on the Red Cedar and built a market for the new power as they proceeded. They did this by acquiring the lighting companies in the surrounding small towns, by extending service to others which had none, and by selling power to other companies. In 1910, the lumbermen completed the 8,000 horsepower moden hydroelectric plant at Cedar Falls and by 1914 they were ready to begin the development of the Chippewa. Then they hesitated when they learned that a single site would cost at least as much as they had previously invested in the entire company.

While they hesitated, the American Public Utilities Company, a holding company owned by Charles B. Kelsy and Joseph Brewer, promoters and engineers, offered them $5,848,000 for the Chippewa Valley properties. This gave the lumbermen a net profit of over $3,000,000 and they accepted the offer. Kelsey-Brewer already owned the LaCrosse Gas and Electric Company. It immediately merged the two into the Wisconsin-Minnesota Light and Power Company. The Kelsy-Brewer organization was aggressive, energetic, skilled and ambitious. The time was auspicious and it immediately began intensive development of the existing electric properties while continuing rapid expansion by acquiring the small hydro plants and other distribution systems in the area. The company was an immediate financial success but healthy earnings from a relatively small utility was not Kelsy-Brewer's goal. The reason for modernizing and interconnecting the Wisconsin-Minnesota system was to facilitate Brewer's larger plan to develop hydroelectric power sites on the Chippewa River and ultimately to bid for control of all electric service in central Wisconsin. He was in a position to do this when WW I began.

The Wisconsin-Minnesota Light and Power Company controlled by the Ingram-Knapp-Stout group and, after 1914, by Kelsy-Brewer, recognized that a potential market is necessary for an economically successful large hydroelectric project. By 1915 the market seemed assured and the Wisconsin-Minnesota Company began planning for a hydroelectric project at Paint Creek on the Chippewa River, two and a half miles above Chippewa Falls, where a fifty-seven foot head could be obtained for a potential power of more than 30,000 kilowatts. This was to be, at the time, not only the largest hydroelectric project in Wisconsin, but the largest in the United States and the entire world. The cost of the Wissota project, as planned in the depressed year of 1915, was to be something over $2,000,000. The actual construction, carried out in the highly inflationary years of 1916-18, cost nearly $6,500,000.

The power from Wissota was far more than the Wisconsin-Minnesota system was expected to need for some years, so a large part of it was contracted to the rapidly growing Consumers Power Company (changed in 1917 to Northern States) owned by the Byllesly interests, which served the heavily populated Minneapolis-St. Paul area in Minnesota. The contract carried a stiff penalty clause for poor water conditions and in the years from 1919 to 1922 the Chippewa had a continuously smaller flow. As a result of this and the fixed expense of the securities issued for the much higher than planned construction costs, Wissota, instead of being an asset, rapidly placed it deeper and deeper in debt to the Northern States Power Company of Minnesota. In 1923 Kelsy-Brewer sold Wisconsin-Minnesota's common stock to Northern States Power Company.

Wisconsin law required that utilities operating in the state must be Wisconsin corporations. The Byllesly interest, therefore, incorporated the Wisconsin-Minnesota Company

as the Northern States Power Company of Wisconsin, a wholly owned subsidiary of the Minnesota company and operated as an integral part of it. The company immediately became prosperous, developed the hydro-electric resources of the Chippewa and other streams in its regions, and was able to give excellent service at constantly decreasing rates to the industry, businesses and homes in its area.

Here again it is illustrated that the electric central station business had become one requiring great financial resources. A prosperous, though somewhat local company, did not have the financial ability or reserve to plan and complete a project which, though surely large for the time, would be small in comparison to those necessary for good economical operation in the years ahead.

Natural Monopolies

Railroads and telephones had each been in existence only a short time before the public and the government recognized that it would be neither practical or economical to have competing companies serving essentially the same area. From this came the practice of the franchised public utility. Some unit of government, such as a city, township, or state would give a company the exclusive right, or franchise, to provide its services in some area over which the unit of government had jurisdiction. In return, the company would have to pay a fee, and also agree to provide certain services, such as a telephone to any person or business requesting a connection, at a cost previously determined by an agreement beween the unit of government and the utility. These franchises were usually for brief fixed times and so had to be continuously renegotiated.

The first Edison and Brush electric generating stations, which could supply, at most, only a few hundred bulbs to customers in a small nearby area, had not seemed to fall into the category of public utilities. However, with the introduction of alternating current and its almost universal adoption after the 1893 World's Fair, it was soon obvious that one company might best serve a whole city, or perhaps even many cities, and that electric generating and distributing companies were public utilities. As such, by 1900 the electric companies were being regulated by municipal governments with the regulation being whatever was most politically advantageous at the moment. Utilities offered a product available from only one source at a predetermined price, and politicians recognized almost immediately that voters often responded favorably to attacks upon them. As stated by McDonald in *Let There be Light,* "Utilities employed several weapons, none of which guaranteed success, and they never gained by fighting politicians. Local politicians had countless weapons, one of which, control over enfranchisement of utilities, was all-powerful, and they never lost and often gained by fighting utilities." Franchises were always for limited times and the utilities were in a constant hassle to stay in business at any kind of a reasonable profit. Responsible leaders in the electric central station, and other similar industries, recognized and propagated the idea that state regulation was a natural corollary of the monopoly principle and that it was the only way that the industry could be made stable and profitable.

The Wisconsin Railroad Commission and its Successor The Wisconsin Public Service Commission

There arose at this time in Wisconsin a political movement, led by a most dynamic politician named Robert M. LaFollette, which called itself "Progressivism." The simplest description of it would be LaFollette versus special interests, with the utilities, particularly the railroads and big business in general, as the special interests. Actually LaFollette was careful never to clearly define or identify these special interests thus leaving it possible to cooperate with individual business interest groups whenever it was mutually advantageous to so do. In addition, LaFollette progressivism had three other elements which made its

position on regulation similar to that of the utility men: (1) Consciously or unconsciously, it espoused increased centralization of government power in the hands of the state. (2) It advocated government by expert commissions. (3) It had a vested interest in vocalizing against utilities and the railroads in particular; the non-Progressive political organizations were closely connected with the city, and other political machines which were considered to be the servants of the special interests and, as such, were natural enemies of the Progressives. These same local governments and politicians would strongly resist any measure which would take away their useful and profitable power to franchise utilities. Thus there was formed an alliance between what would seem to be bitter enemies.

This alliance influenced the 1907 legislature to pass the statute which created the pioneer Wisconsin Railroad Commission. This statute together with important amendments in 1911 and 1913, and its resulting commission, became the model for similar commissions in more than forty other states. It was the first such commission to have real regulatory powers and to use these powers in an enlightened way. The essential features were a three-person commission, appointed for staggered six year terms, with one commissioner being appointed every odd-numbered year. State appropriations were made large enough to enable the commission to attract highly trained engineers, accountants, and other necessary professional help. The record and reputation of the commission indicate that the commissioners were able men who carried out the spirit of the law to the best of their ability.

The responsibilities of the commission were to police the financial activities of all utilities, establish standards of service, and fix rates. Rate-making can surely be classified as the most controversial and troublesome responsibility. The commission operated on the theory that utilities were entitled to receive sufficient income to pay all reasonable and necessary operating expenses and taxes, maintain equipment in a good state of repair, provide an adequate reserve for depreciation, and yield a reasonable rate of return on legitimate and necessary investment in the business. The last has been the most misunderstood and the most difficult to determine. The Wisconsin Commission correctly decided that it takes money to earn money and with no investment there would be no return. Therefore, it set a certain percent of profit for each utility. If the utility, by good management and good fortune, appreciably exceeded this, the commission would have to cut rates. Poor management and smaller profits were not a justification for a rate increase; so the allowable rate of return actually worked out as a profit maximum rather than a minimum as it is often popularly thought to be.

To police the financial activities of the utilities, the 1907 law and the revision of 1911, provided that the utilities must have Commission approval for every issue of securities. This power, combined with that added in 1931 to grant or withhold certificates of public convenience and necessity, gave the Commission complete working control over investments and construction. The Commission also used this power to keep the distribution of kinds of securities at the best balance for the protection of investors.

The Commission also issued indeterminate permits in place of the previous limited term franchises granted by local units of government. Thus, the utility could depend upon a perpetual monopoly so long as it operated in a manner beneficial to the public. Conversely, municipalities could, at any time, purchase all the property of a utility at a "fair price" which would be established by the Commission.

By 1911 the Commission was given control over all water power in the state. From that time on, the Commission's approval of plans and a prior permit was required for the construction and use of hydroelectric generating facilities.

The Wisconsin Commission developed a uniform system of accounting which all

utilities were required to follow. This system was later adopted by the Federal Power Commission and by nearly all other state commissions.

In 1931 the Wisconsin Railroad Commission was reorganized and given the title, the Wisconsin Public Service Commission. It was also given more control over the internal workings of utilities and over the relationships between utilities and holding companies. Finally, provision was made to pass the costs of regulation directly on to the utilities themselves. The creation of the Wisconin Railroad Commission and its successor, the Wisconsin Public Service Commission has great significance to the public, to the utilities, and to government. It gives a middle ground between the extremes of sometimes irresponsible private business on one side and the possible waste and inefficiency of public ownership on the other. It has created conditions under which private enterprise would work both for the benefit of the owners and the general public. During its lifetime it has also served as a model for other states and for the federal government and has demonstrated how such a government agency could generally remain independent despite pressure by business, by politicians, and by various special interest groups.

Northern States
Power Company's Privileges

a. The exclusive right to sell its services in the area granted to it by the WPSC (Wisconsin Public Service Commission).
b. The right to charge its customers for services at the rates set by the WPSC.
c. The opportunity to issue various kinds of securities, raise capital, acquire facilities, pay dividends, retire indebtedness, and conduct its daily business according to rules prescribed for public utilities with special attention to securing prior permission for certain classes of transactions.
d. The right to make a reasonable profit on their investments for its stockholders and the holders of its securities.
e. As a public utility, the right to secure property and right-of-way necessary for the most efficient generation and distribution of its products such as electricity, to the public being served. This includes the right of condemnation where necessary property or right-of-way is concerned and no mutual agreement can be reached.
f. The right to have the WPSC issue or deny permits, act upon requests, make recommendations, etc., in reasonable times and in ways which will facilitate the efforts of the company to give the public the best possible service at the lowest possible cost.

Northern States
Power Company's Responsibilities

a. Northern States Power Company (NSP) must provide service to all potential customers who request it and who are so located in the franchise area that it is physically possible to deliver electricity and gas to them.
b. NSP must charge for its services at rates determined by the WPSC.
c. NSP must maintain its generating and distribution systems and have trained personnel to keep its regular service at high level.
d. NSP must have plans, equipment and personnel to promptly and efficiently cope with natural disasters and any other unexpected interruptions to service.
e. NSP must make plans for the near and more distant future so that adequate service will be available. Plans must be made and approved by the WPSC so that sites and right-of-way can be acquired, equipment planned and ordered and the system given the capability to carry the expected loads. It is much easier to delay or cut back on expansion than it is to hurry it up.
f. Plans must be made for shedding load,

or other actions, to preserve the integrity of the system in the event of an overload above the capacity of the generating units and purchased power available. All possible eventualities must be considered for action with a minimum of inconvenience and cost to the customers.

g. NSP must conform to all laws, rules and regulations, etc., of the WPSC, the State of Wisconsin, the Environmental Protection Agency, the Federal Power Commission, the Occupational Safety and Health Administration, and the Department of Energy, the Securities and Exchange Commission and possibly others.

h. Finally, while complying with all the above, the officers and managers of the company shall run it so efficiently and well that there will be a profit, and therefore dividends, for the stockholders and the holders of any other company securities.

Growth and the Need for Power and Generating Facilities

From 1923 to 1938 the operations of the Northern States Power Company of Minnesota and its wholly owned subsidiary, the Northern States Power Company of Wisconsin operated as an integral company and cannot be considered separately. From 1938 on the Wisconsin company continued operation as an integral division of the Minnesota company but was managed, financed, and regulated as a separate utility.

The financial adjustments and revision of 1938 established the working relationships for the Northern States Power Company of Minnesota and its subsidiary, the Northern States Power Company of Wisconsin, which have been continued since that time. Under it, the Northern States Power Company is a supplier of electrical service in an area of 40,000 square miles in Minnesota, North Dakota, South Dakota, and Wisconsin containing 950,000 electrical customers in 630 communities with approximately 3,000,000 residents in 1975. The NSP electrical system has nuclear, coal and oil-fired steam; hydroelectric; oil-fired turbine; and diesel-powered generating stations; bulk power substations and local distribution systems. It is interconnected with Dairyland Power Cooperative, Cooperative Power Association, some municipally owned systems with which it shares its area, and with all the big utilities on all sides of it to be a part of the Mid-Continent Area Power Pool (MAPP) to give a maximum of reliability of service at a minimum of cost to its customers. It is a member of the National Electric Reliability Council (NERC) through its participation in the Mid-Continent Area Reliability Coordination Agreement (MARCA), which report to the Federal Power Commission on the reliability and adequacy of the bulk power supply of the electric utility systems.

As a public utility, NSP is obligated to provide reasonable and adequate service to all its customers in the area. This means that NSP must be able to provide the maximum amount of energy each customer needs and that it must also be able to provide the total amount of power required by all its customers at any one time. The latter must be accomplished in spite of scheduled maintenance, generating plant failures, transmission line outages, and all other foreseen and unforeseen contingencies, in ways that will keep power outage to the smallest possible area and prevent spreading into a disastrous breakdown of the whole system. This, combined with a constantly increasing demand in most areas (see Table 1) increasing capital and equipment costs, increasing environmental restrictions and regulations, and increasing public resistance to construction and power lines in the latter 1960's made accurate record keeping and scientific analysis for prediction of future needs absolutely vital. A critical problem was upon what factors predictions for future demand could be based. Should curves be plotted for the total energy use and for the peak demand, and then extrapolated? Should certain normalizing factors be used on the data for these

TABLE 1. Maximum Demand and Total Energy Use

	PEAK DEMAND (MW)		*TOTAL ENERGY (GWH)*	
Year	*NSP System*	*NSP Wisconsin*	*NSP System*	*NSP Wisconsin*
1965	1975	260	10140	1489
1966	2177	297	11154	1593
1967	2311	352	11994	1725
1968	2697	324	13413	1923
1969	2893	385	14637	2046
1970	3109	411	15916	2273
1971	3278	420	16697	2337
1972	3674	438	18039	2535
1973	3836	451	18669	2606
1974	3954	471	18783	2662
1975	4206	496	19769	2738
1976	4325	528	20890	2890
1977	4488	572	21300	3110
1978	4629	601	22390	3320
1980	(winter) 4018 (summer) 4667	(winter) 670 (summer) 656	23708	3515
1981	(winter) 4110 (summer) 4681	(winter) 682 (summer) 620	23938	3596
1982	(winter) 4137 (summer) 5222	(winter) 676 (summer) 662	25312	3689
1983	(winter) 4640 (summer) 5389	(winter) 712 (summer) 685	27246	3895

The Lake Superior District Power Company was added to the System in the middle of 1982. In 1983 it had summer and winter peaks of 122 and 137 megawatts and a total use of 817 GWH. The 1983 winter peak was unrefined in February 1984; refining may lower or raise it slightly.

curves before plotting and extrapolating? Should other influences such as the gross area product, population changes, etc., also be worked into the predictions? Both MARCA and MAPP agreed that operation should be with a reserve capacity of 15% each of the individual utilities peak demand. This has historically resulted in adequate reliability for consumers. With electricity becoming more of a prime energy source, and particularly the best and most available source for winter heat in Wisconsin, this reserve capacity becomes more critical.

As of January 1, 1984, the total system of Northern States Power Company had a summer generating capability of 5929 MW and a winter of 6375. This would be with all generating stations available and operating which

would be a happy, albeit unlikely, situation. This total included 1633 MW of nuclear with the rest supplied by coal fired steam turbines for base and intermediate loads and oil fired gas turbines and a small amount of diesel and hydro mostly used for peaking.

Also available by NSP Wisconsin were 747 MW made up of 188 MW of hydro used for baseload and peaking, with the rest nearly all the very expensive to run oil fired gas turbines used only when absolutely necessary. NSP also has a contract to buy energy from Manitoba Hydro and exchanges energy with all neighboring systems when mutually advantageous.

In 1983 the 1633 MW nuclear plants provided about 50% of the electrical energy supplied to NSP customers and it was the economical performance of these that made it possible for NSP to continue some of the lowest electrical rates in the nation.

What Table 1 Shows

a. The system as a whole has had a 172% increase in peak demand from 1965 to 1983. From 1973 to 1983 the increase was 40.5%. The addition of the Lake Superior District contributed 3.7% to the peak in 1983. For the Wisconsin part of the company the corresponding percentages were 174 and 57.8. Although not constant, there has been an increase in the peak demand on the whole system every year of the record. The identification of summer and winter peaks shows the effects of weather but has not changed the overall picture. With the minor variation due to the warm winter, cool summer year of 1982 the Wisconsin record is similar.
b. In total use the system increased 169% from 1965 to 1983 and 47% from 1973 to 1983. The Wisconsin figures are 162% and 49.5%. There has been an increase in total electrical energy use by the whole system and by Wisconsin in every year of the record.
c. Though not shown in the tables, in 1968, 68% of the electrical energy used in Western Wisconsin came from the baseload generating plants in Minnesota. The percentage was about the same in 1983. This poses no problems, except for the distance of transmission, as long as the Minnesota company has the generating capacity available.

Summary

The production and distribution of electrical energy in Western Wisconsin has grown to be a major public utility and a major and highly important industry which affects the life of everybody. The availability and cost of this electrical energy are an important concern of the residents and government. This concern has resulted in the Wisconsin Public Service Commission and an enlightened regulation which is a credit to Wisconsin and a model for other states.

The 1973 energy crisis with the resulting depression, increase in costs, public awareness, and conservation somewhat slowed the rate of increase of both peak demand and total use of electrical energy. However, both continued to increase and there is every reason to expect that this increase will continue as oil and gas become more scarce and expensive and people are forced to turn to electricity for their energy needs.

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NATURAL HAZARD EXPOSURES, LOSSES AND MITIGATION COSTS IN THE UNITED STATES, 1970-2000

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This paper presents the major findings of a three-year study of the exposure of United States population and buildings to nine natural hazards: expansive soils, landslide, earthquake, tsunami, coastal storm surge, riverine flooding, hurricane, tornado, and severe wind.[1] The research utilized computerized probabilistic risk analysis methods to determine annual expected losses for each hazard. The losses were calculated on the basis of long-term exposure of geographic areas in the United States to the various hazards, including estimated magnitude or intensity expected for each area. The research includes an examination of the costs and benefits of a wide variety of possible policies to mitigate the effects of the nine natural hazards on life and property, utilizing a variety of discount rates.

THE INCIDENCE AND COSTS OF NATURAL HAZARDS IN THE U.S.

Almost no portion of the planet's surface is free from the risks produced by hazardous natural events. Scattered around the planet are 516 active volcanoes from which eruptions occur approximately once each fifteen days. The global network of earthquake monitoring instruments currently records approximately 2000 tremors beneath the crust of the earth each day and, almost twice each day, earthquakes of a magnitude sufficient to damage buildings and other structures occur somewhere on the face of the planet. Quakes of sufficient strength to produce widespread damage and death occur fifteen to twenty times each year. Above the surface of the earth, 1800 orbiting thunder storms can be observed at any given time and lightening strikes the planet's outer skin at the rate of 100 times per second. In late summer, 50 or more hurricanes can be observed forming somewhere in the world and, during approximately the same season, from 600 to 1,000 tornadoes strike somewhere in the United States at a rate of four or more per day. Nearly one half billion members of the planet's total population now reside in riverine and coastal flood plains where they produce one third of the world's total products and, on any given day, some fraction of these plains are covered by flood waters.

Many natural events occur only infrequently, but when they do occur, they produce catastrophic results. Natural disasters of major proportions have occurred throughout the history of the United States. Twenty-one years before the adoption of the Declaration of Independence, earthquakes shattered Massachusetts. During the height of the War of 1812, the highest magnitude earthquake in the history of the United States left parts of Missouri and Arkansas permanently sunken. In the immediate post-Civil War years a devastating earthquake struck South Carolina, and, in

1871, a forest fire raged throughout northeastern Wisconsin causing the deaths of more than 1200 persons.

On a single day in 1889, flood waters claimed 2,209 lives in Johnstown, Pennsylvania. Eleven years later, the largest civil disaster in U.S. history occurred when a hurricane pushed the waters of a storm surge over Galveston, Texas, causing 6,000 deaths. Six years later, in 1906, an earthquake rocked San Francisco and, along with the fires produced by the event, caused the deaths of 500 to 700 persons and more than $374 million in property damage. In 1928, a dam collapsed in California, sending a wall of water over an unsuspecting population, sweeping 450 persons to their deaths. Only a few months later a Florida hurricane caused 1833 deaths.

More recently, the Palm Sunday tornadoes of 1965 claimed 271 lives in five states; hurricane Camille (1969) destroyed over $1.4 billion in property and claimed 256 lives; the South Dakota flash flood of 1972 killed 236 persons; the Alaska earthquake (1965) killed 131; and Agnes, the hurricane and tropical storm (1972), caused 118 deaths and property losses in excess of $3.1 billion. On a single day in 1974, separate tornadoes caused the deaths of 318 persons in several southern and midwestern states.

Although less dramatic, a variety of other natural hazards produced considerable damage to property during these same time periods, resulting in substantial annual economic losses. These hazards include expansive soils, land subsidence, landslides, erosion of river and shore banks, periodic droughts, and hail, ice, snow, and rain storms.

The economic losses due to the nine natural hazards considered in this research project are substantial. As shown in Table 1, "Annual Expected Losses from Nine Natural Hazards in 1970, Compared with Annual Value of Other Types of Losses and Events," the annual expected losses from these hazards exceeds all losses from traffic

TABLE 1. Annual Expected Losses from Nine Natural Hazards in 1970, Compared with Annual Value of Other Types of Losses and Events

Type of Loss or Event	*Value in 1970 (Millions of $)*
1. All Property Tax Collections by State and Local Governments	34,054
2. All Accidents	27,000
3. Expected Annual Natural Hazard Losses (2000 Exposure)	17,779
4. All Traffic Accidents	16,200
5. Total Economic Effects of Air Pollution	16,000
6. Health Insurance Premiums	11,546
7. Increase in Annual Expected Losses from Natural Hazards, 1970–2000	9,685
8. Pollution Control Costs (Air, Water, Solid Wastes)	9,300
9. Auto Liability Insurance Premiums	8,958
10. Expected Annual Natural Hazard Losses (1970 Exposure)	8,094
11. Losses from Accidents at Work	8,000
12. Losses from Air Pollution-Related Morbidity and Mortality	6,000
13. Air Pollution Effects on Value of Property	5,200
14. Air Pollution Effects on Materials and Vegetation	4,900
15. Expenditures by All State and Local Police Departments	4,494
16. All Crimes against Property	4,264
17. Investments in Water Pollution Control Facilities	3,100
18. Business Losses Due to Six Types of Criminal Activities	3,049
19. Building Losses Due to Fires	2,209

Source: Petak and Atkisson (1982)

accidents and is approximately half the amount of all property taxes collected by state and local governments.

Public Policy and Natural Hazards

Many public and private actions have been taken in our efforts to mitigate the effects of exposures to natural hazards. Population warning systems have been placed in operation, rivers have been dammed, deepened, and diked. Coastlines have been equipped with sea walls, storm cellars have been dug in back yards, buildings have been elevated above the level of expected flood heights, and a variety of means have been employed to strengthen structures and reduce their vulnerability to the forces exerted by winds, land movement, and other natural hazards.

Unfortunately, these efforts at mitigating losses due to exposure have produced less than satisfactory results. Construction of flood control facilities has seemed to prompt heavy migration into flood prone areas and has, thereby, escalated the real costs of flood exposures. Governmental provision of disaster relief, low cost loans, and subsidized insurance has seemed to encourage, rather than discourage, private risk-taking activity. A public unwillingness to acknowledge the threat of future loss-producing occurrences in high hazard areas and an accompanying faith that government will somehow protect them, has contributed to a continuing population movement into such high hazard areas as the hurricane and flood prone coastal areas along the Gulf Coast and the South Atlantic. Similar population movements have taken place in seismically active areas and along the shores of rivers and lake subject to periodic flooding. As a result, the United States now faces the probability that one or more major community catastrophes, each far greater in loss of life and property than any which have previously occurred in our history, may occur over the span of the next several decades.

At the same time we have ignored the high risks of natural hazard events, we also face the risk of over-reacting to the threats posed by natural hazards and the related risk of implementing public policies which may result in costs far in excess of the benefits they will yield.

Numerous types of building strengthening, area protection, site development, and other technologies are available for use by those who wish to reduce the risks associated with exposure to natural hazards. Mandatory application of these technologies can be forced through adoption of a wide variety of federal, state, and local public policies. Hazard mitigating amendments to building codes, subdivision standards, and land use regulations can be enacted. Hazard zones can be identified and sanctions employed to prohibit development in such areas. The risk of loss may be spread through use of insurance schemes. The impact of catastrophic events on exposed populations may be reduced through community safety plans, disaster relief, and recovery measures financed by non-impacted parties.

What mix of these measures to employ, when, where, at what cost, and to whom, has become a major public policy question. To assist in resolving this question, the authors have conducted an interrelated set of policy studies of this subject[2] and have anchored these studies on findings from a computer-based study of U.S. population and building exposures to nine natural hazards over the period 1970–2000.[3] The computer models used in the study were based on risk analysis procedures developed to predict annual expected losses arising from the periodic occurrences of these hazards and were supplemented by procedures which permit examination of the relationship between the costs and benefits associated with applying a variety of loss-mitigating measures in the U.S. natural hazard zones.[4]

Annual Expected Losses and Exposed Populations

Application of risk assessment models resulted in estimates of nationally aggregated annual expected natural hazards losses

TABLE 2. Expected Annual Losses from Natural Hazard Exposures in the United States By Type of Hazard and Type of Loss, 1970 and 2000

Expected Annual Losses

Hazard	Building Damage* (Millions of 1970$)		Number of Deaths		Housing Units Lost		Person Years of Homelessness		Person Years of Unemployment	
	1970	2000	1970	2000	1970	2000	1970	2000	1970	2000
1. Earthquakes	781.1	1,553.7	273	400	20,485	22,858	736	648	413.5	634.9
2. Expansive Soils	798.1	997.1	—	—	—	—	—	—	—	—
3. Hurricane	1,056.0	3,528.3	62	153	31,885	52,237	34,505	48,271	21,004	58,223.7
4. Landslides	370.3	871.2	—	—	—	—	—	—	—	—
5. Riverine Flooding	2,758.3	3,175.33	190	159	—	—	—	—	—	—
6. Severe Wind	18.0	53.4	5	11	547	748	852	1,014	373.1	850.9
7. Storm Surge	641.2	2,342.9	37	103	24,521	43,757	7,290	10,330	369.7	1,018.3
8. Tornado	1,656.0	5,219.1	392	920	36,212	52,119	86,122	107,630	57,541.6	146,568.5
9. Tsunami	15.0	40.4	20	44	234	335	345	389	97.5	195.9
Totals	8,094.0	17,779.4	979	1,790	113,884	172,084	129,850	168,302	79,799.1	207,492.2

* Includes Contents, Income, and Supplier Loss.

for 1970 and 2000. These data are summarized in Table 2. The study revealed that natural hazard exposures in the year 1970 produced annual expected dollar losses totalling approximately $8 billion and nearly 1,000 annual expected deaths. Approximately 71 per cent of the expected dollar losses for 1970 resulted from building damage, approximately 24 per cent from damage to building contents, and the balance from expected losses sustained by workers and increased costs of transporting goods due to delays and reroutings. The study showed that annual expected natural hazard losses (in 1970 dollars) would rise to approximately $17.8 billion in the year 2000 and that building contents losses will rise to approximately 40 per cent of that total. Annual expected deaths from natural hazard exposures were predicted to increase to 1790 in 2000. Expected annual national losses from exposure to all nine hazards produced per capita losses of $39.76 in 1970 and $69.41 in 2000 (1970 dollars).

Mitigation Technologies and Costs

Seventeen potential loss-reducing strategies were examined in detail, representing five different major approaches to managing natural hazard risks. The five include hazard avoidance, area structure protection, building strengthening, site preparation, and building removal. The seventeen potential strategies are listed in Table 3. Each mitigation strategy is related to the hazards for which it is potentially applicable.

As a result of technology and cost analyses, it became clear that the high levels of hazard exposure the study predicted for the future need not occur; they can be prevented or lessened through use of several types of technologies and through implementation of a variety of public policies. The analysis revealed that building damage losses alone could be reduced by approximately 42 per cent from those projected for the year 2000. However, the study also revealed that no loss-reducing strategy is completely free

TABLE 3. Hazard-Mitigating Technologies, by Type and Applicability to Nine Natural Hazards

Technology by class and title	*Hazard to which applicable*								
	Riverine flooding	*Storm surge*	*Tsunami*	*Hurricane*	*Tornado*	*Severe Wind*	*Earthquake*	*Landslide*	*Expansive Soil*
1.0 Hazard Avoidance Strategies and Technologies									
1.1 Zero growth on fifty-year flood plains after 1980		●	●						
1.2 Zero growth on 100-year flood plains after 1980		●	●						
1.3 Zero growth on fifty-year riverine flood plains in specified additional numbers of flood-prone cities each year, to 2000	●								
1.4 Zero growth in counties exhibiting high Tornado Strike Risk (greater than 10^{-4} tornado strikes per year per square mile).					●				
2.0 Area Structural Protection Strategies									
2.1 Structural protection (dams, levees, etc.) of cities with riverine flood problems.	●								
2.2 Construction of sea-walls to protect four additional counties per year from 100-year storm surge heights. Construct in order of decreasing damages in affected counties.		●							
3.0 Building Strengthening Strategies									
3.1 Require tie-downs on all mobile homes.				●	●	●			
3.2 Increase designed wind resistance capability of new buildings to level equalling 1.5 x the level specific in the Uniform Building Code (1.5 x UBC)				●	●	●			
3.3 Increase designed wind resistance capability of new buildings to level equalling 3.0 x the level specified in the Uniform Building Code (3.0 x UBC).				●	●	●			
3.4 Increase strength of new buildings to level required in UBC Earthquake Zone #3. (UBC 3).							●		
3.5 Floodproof 2% annually of all structures in fifty-year riverine flood plains to provide zero damage to height of four feet.	●								
3.6 Floodproof 2% annually, of all structures in 100-year riverine flood plains to provide zero damage to height of four feet.	●								
3.7 After 1980, floodproof all new buildings in storm surge areas to height of four feet.		●							
3.8 Modify and retrofit existing buildings in high seismic risk areas to meet seismic safety standards.							●		
4.0 Site Preparation Strategies									
4.1 Require soils testing and improved site grading standards in landslide-prone areas.								●	
4.2 Require soils testing and pre-construction moisture control and/or soil stabilization on construction sites.									●
5.0 Building Removal Strategies									
5.1 Purchase and/or condemn and accelerate removal of high vulnerability structures in high hazard areas.	●	●	●				●	●	

Source: Petak and Atkisson (1982).

from economic or social cost and that overzealous use of some strategies might actually increase total national hazard exposure costs when these costs are defined to include both the losses resulting from hazard exposures and the costs of implementing the mitigations used to reduce such losses.

Examination of the annual amortized costs of implementing each alternative loss-reducing strategy resulted in the finding that many strategies are not cost-effective; their annual principle repayment and annual interest requirements exceed the projected value of their loss-reducing potential. The data generated by this study suggest clearly that imprudent and overzealous application of risk-reducing mitigations could actually increase net annual expected natural hazard costs in 2000 from 38.4 to 90.0 per cent above the levels that would be experienced if current policies remain unaltered.

Not all costs and benefits associated with implementation of mitigation strategies were included in the study. For example, the study did not include estimates of hazard-induced loss of public infrastructure. Perhaps more importantly, the study did not place an economic value on the reduction in human mortality that might result from application of more rigorous hazard management strategies. The authors do not attempt to place economic values on human life; they prefer to analyze the cost required to avert deaths. Such costs are often more meaningful to policy makers.

The procedures used to estimate losses were based on assumed, but empirically-supported, relationships between the magnitude of dollar loss associated with hazardous occurrences and the loss of life associated with such occurrences. This method resulted in annual expected life loss estimates which were substantially greater for 1970 than the annual average life loss from natural hazards actually reported for any of the decades in the current century. Moreover, both hazard-induced death rates and the absolute annual average number of deaths has been declining rather steadily throughout the century. Thus, even though the estimates of life loss were probabilistically derived and therefore reflect the intermittent and large losses of life which may be expected from major catastrophes, the annual expected estimates of life loss may overstate the consequences of natural hazard exposures. Past mitigations, including installation of warning systems, may be working effectively. On the other hand, since the estimates are probabilistic, and since the events are intermittent and characterized by massive losses, we may simply have been fortunate so far this century.

Even if the expected hazard-induced mortality predicted in the study were to occur, the annual expected estimates of life loss reported in the study are not as impressive as the mortality from other causes in our society. Examination of evidence suggests that the cost per death averted in natural hazard risk reduction programs can well be escalated to levels substantially in excess of those associated with other death and injury reducing programs which currently may be under-funded. Although this inference is not intended to suggest that life loss reduction should not be an objective of natural hazard management programs, neither does it seem appropriate to overstate the benefits and to understate the costs associated with such programs.

Notes

[1] The studies which resulted in this report were supported, in part, by National Science Foundation Grant Number ERP-09998, and by National Science Foundation Purchase order 78-SP-0620. In a substantially expanded form, the data reported here are also included in William J. Petak and Arthur A. Atkisson, *Natural Hazard Risk Assessment and Public Policy*, New York: Springer-Verlag, Inc., 1982.

[2] See, for example: (1) William J. Petak, Arthur A. Atkisson, Paul H. Gleye. *Natural Hazards: A Public Policy Assessment*. Redondo Beach, California, J. H. Wiggins Company, 1978 NTIS #PB297361/AS A23; (2) Arthur A. Atkisson, William J. Petak, Daniel J.

Alesch, et al, *Natural Hazards and Public Policy: Recommendations for Public Policies to Mitigate the Effects of Natural Hazard Exposures in the United States,* Green Bay, Wisconsin: University of Wisconsin-Green Bay Papers in Public Policy and Administration, 78-2 (December 1978); (3) Arthur A. Atkisson and William J. Petak, *Seismic Safety Policies and Practices in U.S. Metropolitan Areas.* (A Report to the Federal Emergency Management Agency), Redondo Beach, California: J. H. Wiggins Company, January 1981.

[3] William J. Petak, Arthur A. Atkisson, Paul Gleye, op. cit.

[4] J. Hirschberg, P. Gordon, and W. J. Petak. *Natural Hazards: Socioeconomic Impact Assessment Model.* Redondo Beach, California: J. H. Wiggins Company, 1978. NTIS # PB294681/AS A10.

MEDIA OF EXCHANGE

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The term "medium of exchange" is applied to any thing, object, or document given and taken in the process of exchanging goods or services. The phrase "medium of exchange" describes the function of the thing. The thing that people agree to give and take to facilitate the exchanging of their goods and services is, by its function, a medium of exchange.

In the United States today an informed business or professional man will say our media of exchange consists of the following:

1. Federal Reserve notes
2. United States token coins
3. A few United States notes
4. Checks written against demand deposits in commercial banks.

An economist is very likely to say these four items make up our purchasing media.

A banker would say these four items make up our money supply.

So the phrases, *media of exchange, purchasing media,* and *money supply,* all mean the same things: the things we give and take in the process of exchanging our goods and services.

Goods and services can be exchanged either directly or indirectly. When the exchanges are made directly without any medium to facilitate the exchange, such exchanges are called direct bartering. When the exchanges are made indirectly, i.e., by the use of a medium to facilitate the exchanges, such exchanges are called indirect bartering or buying and selling.

The items that serve as media of exchange in direct bartering are items with exchange value in themselves, such as: full bodied gold and silver coins, salt, grain, nails, soap, tobacco, beaver skins, etc. The items given and taken have about equal exchange value. Neither the item given nor the item taken gives evidence that it is a claim for any other goods or services. They do not have to be redeemed for anything.

However, governmental bodies, private corporations, and individuals may declare that they will accept such items as payments due them. Any item the government will receive as a payment will be received by almost everyone as a payment. That is why people will choose to use it as a medium of exchange.

The items that serve as media of exchange in indirect bartering, i.e., buying and selling, are documents, bills, certificates, and tokens which give evidence that they are a claim for some goods or services or that they will be received as a payment due the issuer.

If a governmental body will receive these items as payments due it, everyone else will receive them as payments also. The people will then choose to use such items as media of exchange. That is, the people will choose to use such items as media of exchange, if they are issued in denominations and in a form convenient for making payments. If they are not issued in denominations and in a form convenient for making payments, people will not choose to use them as media of exchange.

For example, at the present time the U.S. government will issue to the people in exchange for Federal Reserve notes or in exchange for demand deposits of bank credit all the present U.S. coins the people want. The coins are legal tender for the payment of all debts to governmental bodies, private corporations, and individuals. They are brought into circulation without incurring interest-bearing debts. But people choose to use them only for small payments. They

could be used for large payments, but they are not used for large payments because they are not issued in denominations and in a form that is convenient for making large payments.

We should note from what has been said, that of all the items we mentioned, none were issued for the *sole* purpose of serving as a medium of exchange. Grain, salt, nails, tobacco, and beaver skins were produced for some other use. People chose to use them as media of exchange because they were acceptable and useful for some need of the people.

When our first full-bodied gold and silver coins were made, they were not issued by the U.S. government to serve as payments for the expenditures of the government. The people brought gold and silver to the U.S. Mint. The mint made the metal into standard coins as a service to the people.

After the metal was made into coins, the coins were given to the persons who brought the metal to the mint. The coins belonged to them. They could use the coins for any purpose they wished. The coins were not government owned coins.

When the U.S. government agreed to accept the coins as payments due it (by declaring them to be legal tender at or above the market value of the metal in the coins), everyone else also accepted them as payments. Thus the people chose to use them as media of exchange.

Note well, the U.S. government officials did not tax the people to buy the gold and silver to make the full-bodied coins. The officials said in effect, "All who want gold and silver coins, bring the metal to us. We will make it into standard coins for you. And we will receive such coins for all payments due the U.S. government at or above the market value of the metal in the coins."

These were not the exact words of the government officials, but the effects that took place were as if those words were said.

As we see it, any government in the world can do that. Such action will not be any burden on the taxpayers. But that alone will not give the people debt-free purchasing media.

We stated that the items that serve as media of exchange in the process of buying and selling (indirect bartering) consists of documents—certificates and tokens—which give evidence that they are a claim for some goods or services or that they will be received as a payment due the issuer.

Who Can Issue Such Documents?

Any governmental body that levies taxes can issue such documents. It can issue tax credit certificates in denominations convenient for small and large payments. It can pay them out for its needed goods and services. It can levy a tax in a dollar amount equal to the dollar amount of the certificates paid out. It can receive them for all payments due it. It must redeem them when they are presented as the payment for the taxes levied for the expenditure for which they were issued as a payment. Any certificate or token that a governmental body will receive as a payment the people will choose to use as a medium of exchange.

Private corporations can also issue and pay out certificates of credit in exchange for goods and services. If they are issued in convenient denominations for making large and small payments, they too can serve to a limited extent as media of exchange.

But the main point we wish to bring out here is to show what items the U.S. government can issue to serve as media of exchange.

Many times we read or hear the statement that the government should issue our money. By the word "money" is meant the items to serve as media of exchange. So let us examine the power the U.S. Constitution gives Congress regarding the issuing of items to serve as media of exchange.

Article 1, Section 8, Clause 1, reads, "The Congress shall have Power to lay and collect taxes . . ." It is this section of the Constitution that gives Congress the power to decide what items it will receive as payment for the taxes levied. This is the section of the Constitution that gives Congress the power to issue the tax credit certificates that

will be received as the payment for the taxes levied. If the government issues them in denominations convenient for making large and small payments, the people will use them as media of exchange.

Article 1, Section 8, Clause 5, reads, "The Congress shall have Power to coin money." The word money at that time meant coins and only coins to the writers of the U.S. Constitution.

So Congress can issue only two things that the people could use as media of exchange, tax credit certificates and coins.

Tax credit certificates can be issued in good faith only if the Congress levies a tax in a dollar amount equal to the dollar amount of the certificates issued.

Full-bodied gold and silver coins can be issued in good faith only in the amount that can be made from the gold and silver brought to the mint by the people who want the metal made into coins. They will pay them into circulation.

Token coins and certificates in lieu of coins can be issued in good faith only in the amount the people are willing to buy in exchange for their other currency or bank credit already in circulation.

Note, all the above coins and certificates are either paid or sold into circulation. The Constitution does not give Congress the power to loan into circulation any coins, certificates, or credit to serve as media of exchange.

So if, and when, the people ask Congress to supply them with media of exchange, they must tell Congress the specific items they have in mind and they must tell Congress how those items are to be brought into circulation. Remember, they must be brought into circulation without anyone incurring an interest-bearing debt.

Face Value of the Currency

Let us explain on which items of the currency the face value should be written. We have previously stated that full-bodied gold and silver coins have exchange value in themselves. They are commodities. They are not documents giving evidence of a claim for anything. Their exchange value may change from day to day.

No one, not even a governmental body can with honesty and justice put a set or a fixed market exchange value on a commodity that is being bought and sold all over the world and have it remain fixed over a period of time.

The writers of the U.S. Constitution were fully aware of that fact. That is why they did not authorize the Congress to put a fixed value on the full-bodied gold and silver coins. They gave the Congress the power to regulate—to adjust—the value of the yet to be minted U.S. gold and silver coins in the same manner as was being done with foreign gold and silver coins.

The value of the foreign gold and silver coins was being regulated or adjusted to the market value of their metal content at the time the coins were used as payments.

Therefore, we conclude that full-bodied gold and silver coins should not have a fixed value stamped on them. They, however, should have stamped on them the weight of the pure metal in the coins.

Gold and Silver Coins are Commodities

Full-bodied gold and silver coins are commodities used in direct bartering. In direct bartering the exchange value of the items bartered is established at the time the transaction takes place. So the proper time to establish the exchange value of full bodied coins is at the time they are exchanged for other goods or for services or used as a payment.

From what we have said, we can see that foreign full-bodied gold and silver coins can serve as media of exchange just as well as the domestic gold and silver full-bodied coins.

In the United States, at the present time, there are many full bodied gold and silver U.S. and foreign coins. All that is necessary to bring them into circulation to serve as currency is for the U.S. Congress to announce that all U.S. and foreign full-bodied gold and silver coins will be received by the

U.S. government for all payments due the government at the market value of their metal content at the time they are offered as the payment.

The Congress should also announce that the government will pay out these same coins for its needed expenditures at the market value of the metal in the coins at the time the coins are paid out. This is the way the foreign gold and silver coins served as currency in the early days of our country.

This is the way they would have continued to serve as currency, if the U.S. government had not placed a fixed exchange value on the U.S. gold and silver coins and then later refused to receive and pay out foreign gold and silver coins.

There is another way to bring the U.S. and foreign gold and silver coins into circulation to serve as currency. That is, for one or more of the individual states to declare by law that it will receive U.S. and foreign gold and silver coins for all payments due the state at the market value of the metal in the coins at the time the coins are received as payment. And also that the state will pay out these same coins for its needed expenditures at the market value of the metal in the coins at the time the coins are paid out.

While we know that it is not necessary to use gold and silver coins as currency, we have to illustrate how they can be used successfully.

We have shown that if full-bodied gold and silver coins are to be successfully used as currency, a fixed exchange value cannot be placed on the coins. But that is not true for all other types or purchasing media.

All token coins, certificates, notes, and bills used as currency must have a fixed exchange value placed on them because they are documents. They give evidence. They give evidence of the value of the payment or article for which they will be received or redeemed. For example, the U.S. Congress has declared that all token coins are legal tender for the payment of all debts, public and private. The face value of the token coins is the amount of the payment for which the coin will be received by the government and others. The amount of the payment must be written on the coin.

The Federal Reserve notes also are documents. They also given evidence of the legal tender law passed by Congress. Part of the law is written on the notes.

Gold certificates, silver certificates, tax credit certificates, certificates in lieu of coins, and certificates of credit are all documents. They give specific evidence of the amount of the claim or the payment for which they will be received.

They are like postage stamps. Postage stamps give evidence of the amount of the payment that was made for postal services. That amount is printed on the face of the stamps.

So it is necessary that the token coins, notes, and certificates have their exchange value stamped or printed on them.

BOTANISTS AND NATURALISTS AT DEVIL'S LAKE STATE PARK, WISCONSIN

KENNETH I. LANGE
Devil's Lake State Park
Wisconsin Department of Natural Resources

A traveler north-bound on Interstate Highway 90-94 in south-central Wisconsin notices a range of hills high and massive against the skyline for some time before the Baraboo-Devil's Lake exit. This is the Baraboo Range, an anomalous outcrop of pre-Cambrian, metamorphic rock amid otherwise younger, sedimentary rock. Generally called the Baraboo Hills or Baraboo Bluffs, this outcrop, actually a syncline, consists of an elliptical ring of quartzite rock extending for a west-east distance of 25 miles and enclosing the canoe-shaped Baraboo valley, with a north-south distance averaging 5 miles. Devil's Lake and Devil's Lake State Park are located in the southern half of the quartzite ring, three miles south of Baraboo, in Sauk County. Greatest relief is attained at Devils's Lake, where three 500 foot bluffs with talus slopes (west, east and south) flank a spring-fed body of water approximately 360 acres in area (Fig. 1).

The Baraboo Range is rich in geologic history and features, and has been visited by geologists since 1848 and school classes since

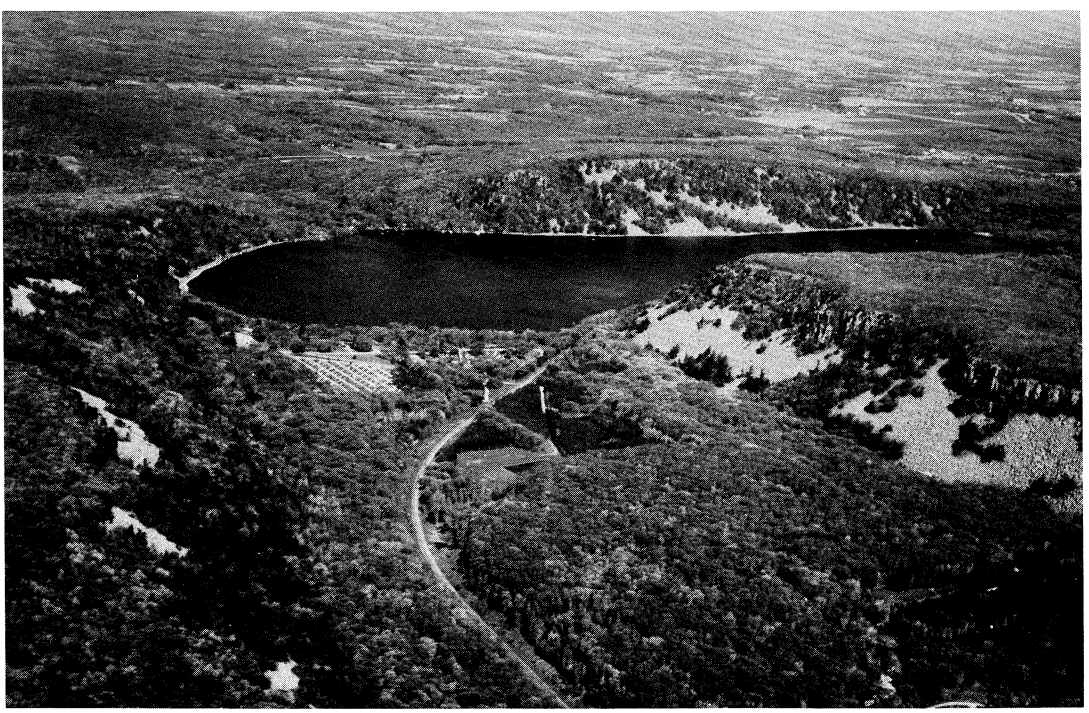

Fig. 1. Devil's Lake and the surrounding country as seen from an airplane. The west bluff is in the upper part of the picture, the east bluff is to your right, and the south bluff to your left. Notice the railroad track through the middle of the lower half of the picture, the talus slopes, and the prairie strip along the upper edge of the south end of the east bluff.

the late 1800s. Black (1968) and Dalziel and Dott (1970) detail the geology of the area, and Lange and Tuttle (1975) and Lange and Berndt (1980) discuss park history, including educational use.

The land cover in 7400 acre Devil's Lake State Park is primarily red oak woods with red maple understory, but because of the relief and varying exposure it also includes sugar maple woods, stands of yellow birch, white pine groves, boreal fern gardens on north-facing talus slopes, thickets of red elder and mountain maple and pockets of northern herbaceous plants at the bases of the bluffs (such as in the linear depression at the base of the east bluff called "Alaskan Grotto"), marshy areas, and dry prairie relicts on top of the bluffs. Mossman and Lange (1982) discuss pre- and post-settlement vegetation of the Baraboo Hills, including Devil's Lake State Park.

With such a varied land cover, one would expect a rich flora. The vascular plant list for the park now stands at 798 species, approximately 40% of the total vascular flora of Wisconsin. An addition 233 species occur in the Baraboo Hills only outside of the park (Lange, unpublished ms; *Crataegus* spp. are not distinguished).

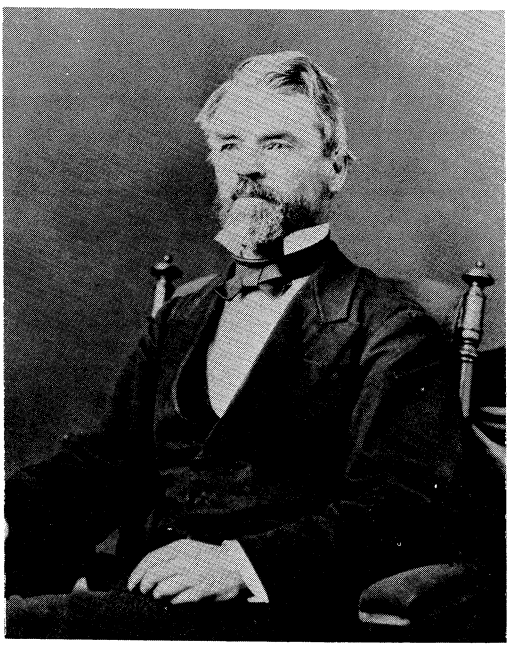

Fig. 2. Wisconsin's pioneering naturalist, Increase Allen Lapham. From the collections of the State Historical Society of Wisconsin.

Devil's Lake has consequently been a magnet for botanists and naturalists, as well as geologists. In the early years they came by wagon, then, beginning in 1873 when the main passenger line of the Chicago and Northwestern was completed, also by train.

Wisconsin's pioneering naturalist, Increase Allen Lapham (1811-75), seems to have been the first botanist to have explored Devil's Lake, doing so in 1849 with several companions: "A large body of broken fragments have accumulated along the edge of the water rendering it very difficult to walk along shore: yet two of our party made a circuit of the lake, jumping from rock to rock as best they could" (Lapham, 1849). On Lapham's 1850 map of Wisconsin, Devil's Lake is called "Lake of the Hills," a local name he heard on the 1849 trip.

Lapham (Fig. 2) was the true naturalist: he had to explore and understand. As a youngster in Palmyra, New York, he was once sent to fetch the family cow: in his diary, he recorded a variety of natural happenings, but "didn't find the cow" (Milwaukee *Free Press,* 8 March 1911). As an adult he apologized to a brother for not writing sooner: ". . . my head has been so full of topography, geography, etc., etc., that it would not contain the material for a letter besides" (Milwaukee *Sentinel,* 16 October 1895, Part 2, page 12). In the last entry in his notebook, dated the day before he died, Lapham referred to a plant that he had never found before (Hawks, 1960, p. 277).

When asked his speciality, Lapham replied, "I am studying Wisconsin" (Sherman, 1876, p. 51). Lapham was a generalist, not a specialist, yet despite his diversity of interests and lack of formal education, he associated scientifically with his contemporaries in a variety of fields and was accorded universal respect by his peers

(Hawks, 1960, p. 279; Sherman, 1876, pp. 50-51). To Asa Gray of Harvard, for example, Lapham was thoroughly reliable, a "modest, retiring, industrious, excellent man" (Sherman, 1876, p. 21). Lapham and Gray met several times, for example in 1847 when Lapham traveled east where in Boston he had supper at Gray's with John Carey and William Oakes, and "didn't we four great Bostonians have fine times" (Hawks, 1960, p. 136).

Lapham wrote at one time or another to literally dozens of botanists, American and foreign, some of whom are now unknown, although others continue to be familiar names. He also had a national reputation as a "good exchanger," that is, someone who exchanged plant specimens generously and promptly (Hawks, 1960, pp. 149-150, 155).

Speaking as a botanist, Lapham preferred "spring and summer all year." By 1841 he had a "very handsome collection of dried plants, numbering something over 2,000 species," and was adding to it by exchanges (Milwaukee *Sentinel, loc. cit.*). Asa Gray by 1840, for example, had received plants from a total of 78 Americans of whom Lapham was his only contributor from Wisconsin Territory (Dupree, 1959, p. 96). These were the years when John Torrey and Gray were working on their *Flora of North America* (now in its 8th edition as *Gray's Manual of Botany*). Lapham sent plant specimens to Torrey and procured subscriptions for the *Flora* (Rodgers, 1965, p. 125).

In 1849 Lapham offered the University of Wisconsin his collection of plants if the University would preserve them properly, but he was refused (Noland, 1950, p. 83). Lapham also corresponded with the Wisconsin Natural History Association about his scientific collections, but here too the negotiations collapsed (Schorger, 1947, p. 174). The year after he died, Lapham's extensive scientific collections, including a 24,000 specimen herbarium of approximately 8000 species, was purchased for $10,000 by the State for the University (Arthur, 1881, p. 52; Bryan, 1950, p. 13). Lapham's plant collection was the beginning of today's University of Wisconsin Herbarium, as the other University botanical collections of the time were consumed by the 1884 Science Hall fire (Davis, 1925). Recently a series of lichens collected by Lapham has emerged from the past, but this has a different history (Thomson, 1973).

Sixteen years after his death, Lapham received special recognition as the most distinguished past citizen of the State of Wisconsin in a contest judged by the State Agricultural Society (Winchell, 1894, p. 1), a fitting epitaph to a remarkable individual.

Another exceptional naturalist, Thure Ludwig Theodore Kumlien (1819-88), was the first person to actually collect plants at Devil's Lake, insofar as extant herbarium specimens attest. The Milwaukee Public Museum has Kumlien specimens collected at Devil's Lake in 1860, and he very likely was here at other times also. "Camping trips" by Kumlien to Devil's Lake (for "preglacier flowers") are mentioned in her biography of her grandfather by Main (1944, pp. 333-334).

Kumlien, the oldest of fourteen children, was born in Sweden. Young Thure showed an early interest in natural history and was entrusted to a private tutor, later graduating from the University of Upsala where he studied under the renowned botanist, Elias Fries. Coming to America in 1843, he settled near Lake Koshkonong in southeastern Wisconsin because he had concluded from studying maps that this region would be rich ornithologically.

Kumlien hoped to make a living by selling natural history specimens to museums, American and foreign, and he wanted to travel (Kumlien, 1859). He did collect intensively around Lake Koshkonong and on a few trips but his income from these endeavors typically was meagre, so despite a background ill-prepared for farming he continued to work his land, albeit in a desultory way.

Like Lapham, he was the complete naturalist, being familiar with the fauna of his chosen homeland and its plant life, vascular and non-vascular. Kumlien authored only one paper under his name, a two-page note on the disappearance of wildflowers in the Lake Koshkonong area (Kumlien, 1876). Owing to his diffidence, he was well known to very few scientists, although they typically had heard of him and Lake Koshkonong.

In the latter years of his life, Kumlien taught at the nearby Albion Academy, collected birds for several schools, and was taxidermist and conservator at the Milwaukee Public Museum when he died (Greene, 1888; Lawson, 1921; Schorger, 1946).

A visit to the site of the original Kumlien homestead, a log cabin, reveals lilac bushes, several kinds of planted trees, a ground cover of periwinkle and lily of the valley, and a depression where the building stood. The Kumliens moved from the cabin into a frame house in 1874. Among her grandfather's papers in a trunk in the cabin, Main (1944, p. 337) found some lines written in pencil on an envelope by Kumlien after his wife had died: "We now have fine weather again and when I have time to spare I spend it in the old house . . . It reminds me . . . of old times and as much as says to me, 'Look at me now, we are old friends though of late you seem to not have cared so much about me as you used to. But I tell you that there is a great deal of similarity between us two. We both belong to the past, our present isn't much and our future prospects still less, my timbers are partly gone up, so are yours—age is upon me—so with you. With a little tender care I may last and be good for something yet a little while—so may you. I wasn't cut out for pretensions and show in the world, nor were you. Circumstances put me in a kind of out of the way place not very conspicuous to the public, yet many are they who have visited me. So with you. At the same moment we both lost our best friend, one who did more for us both than anyone else ever did. I have after all, been a comfort to some—perhaps you have too. I have served the purpose for which I was made. Have you?'"

One of Kumlien's children, Aaron Ludwig (1853-1902), was also a well rounded naturalist (Schorger, 1945). He taught in southern Wisconsin at Albion Academy and Milton College where one of his students was Arlow Burdette Stout (1876-1957). Stout was born in Ohio and grew up on a farm near the Kumliens, where he spent countless hours afield and attended a one-room country school. In 1903 he rescued a number of Thure Kumlien plants, including a Devil's Lake sedge (*Carex leptalea*), which had been left in the garret of the old log cabin. These undated specimens, apparently 37 in all, are now at the University of Wisconsin (University Herbarium, Collectors' Files).

Stout graduated from the State Normal School at Whitewater, then taught science at Baraboo High School from 1903-07, spending weekends and parts of his vacations in field work, mainly in the Baraboo area. The University of Wisconsin has specimens, mostly pondweeds (*Potamogeton* spp.), collected by Stout at Devil's Lake in 1904, 1905, and 1906.

Stout's early interests included ornithology and archeology. As a young man, Stout mounted birds and collected bird skins and eggs, and in the summer of 1904 invited a Baraboo High School student, Alexander Wetmore, to spend several weeks with him at Lake Koshkonong. Soon after this, Wetmore left Wisconsin to eventually become Secretary of the Smithsonian Institution and an internationally known ornithologist. Stout's archeological field work in the Baraboo area resulted in a 60-page paper on the archeology of eastern Sauk County which appeared in the *Wisconsin Archeologist*.

Stout was an instructor in botany at the University of Wisconsin when he accepted the position of Director of Laboratories at the New York Botanical Garden in 1911, a

position he held until his retirement in 1947. He is best known for his studies on the sterility and fertility of seed plants, especially the day lily (Robbins, 1958; Stout, 1939).

In 1882 "Miss Remington" collected the only known specimen of twin-flower (*Linnaea borealis*) from the Baraboo Hills; the locality is "Baraboo." The locality has intrigued me more than the identity of "Miss Remington" (the collector might have been May Belle or Maud Estelle Remington, graduates of the University of Wisconsin in 1881—Sauk County *Democrat,* 25 June 1881). Science classes from Baraboo High School have been coming to Devil's Lake for field trips since the 1800s, for example the botany class to Pine Hollow (Pine Glen Scientific Area) in 1898 (Baraboo *Republic,* 11 May 1898). Possibly the plant was found in this locality, a steep, wooded gorge in the park, but deliberate search by the author for twin-flower in Pine Hollow has been unsuccessful.

Devil's Lake was becoming a popular place to search for plants by the late 1800s and early 1900s. C. H. Sylvester did so in 1886, collecting both on the bluffs and in the lake, and William Finger was here in 1903; the herbaria of Sylvester and Finger are at the Milwaukee Public Museum. Will Sayer Moffat (born in 1847) was an M.D. and active student of the flora of the Chicago region for many years; he collected at Devil's Lake in 1895 (specimens at the University of Wisconsin).

Levi M. Umbach (1853-1918), a science instructor at North-western College (now North Central College) in Naperville, Illinois,

Fig. 3. An "excursion" of University of Wisconsin students on the west bluff overlooking Devil's Lake in the 1890s, Lellen Sterling Cheney (marked with an x) the instructor. From the University of Wisconsin Herbarium, Collectors' Files.

was an avid plant collector who compiled a herbarium of some 45,000 plants. The Umbach Herbarium was purchased by the University of Wisconsin in 1927 (Williams, 1929, p. 1). Umbach visited Devil's Lake every year from 1895 through 1900 and among his Devil's Lake specimens are the only collection of a dryland sedge (*Bulbostylis capillaris*) and the first collection of an uncommon gerardia (*Agalinis gattingeri*). H. S. Pepoon's *Flora of the Chicago Region* is dedicated to Umbach, "best of friends and most enthusiastic of plant collectors."

Several University of Wisconsin faculty members visited Devil's Lake around the turn of the century, specifically, Lellen Sterling Cheney (1858-1938), Rodney Howard True (1866-1940), and Edward Kremers (1865-1941).

Cheney was the pioneer of systematic botany in Wisconsin. He was in charge of the University Herbarium from 1891-1903 and undertook botanical surveys of the Lake Superior shore and the Upper Wisconsin River valley. Transportation was by canoe or some other type of boat in a Wisconsin more primeval than any of us can ever know. Mosses were his main interest; in fact, he was preparing a catalogue of Wisconsin mosses at the time of his death (Cheney, 1938; Conklin, 1941, p. 6), but he also added many vascular plants to the University Herbarium. His vascular plant collections from Devil's Lake (1891-1900) include such species as rock fern (*Polypodium vulgare*), twisted-stalk (*Streptopus roseus*), mountain maple (*Acer spicatum*), red elder (*Sambucus racemosa* subsp. *pubens*), and bladdernut (*Staphylea trifolia*). Cheney taught a number of courses and in at least one of them "excursions" (Fig. 3) were offered (Anon., 1900, pp. 125-126).

True was from Baraboo, a son of John M. True who at one time was a state senator (Baraboo *Republic,* 28 July 1892; Baraboo *Weekly News,* 22 April 1926). He and Cheney often took field trips together, e.g. to Wisconsin Dells (Lange, 1981, 1982) and Devil's Lake (Fig. 4). True's collections from Devil's Lake (1889-93) include green dragon (*Arisaema dracontium*), a wetland arum that no longer can be found here; the scarce Hooker's orchid (*Platanthera hookeri*); and a southern bush-clover (*Lespedeza virginica*), known in Wisconsin only from a few localities in the Baraboo Hills and a rhyolite outcrop approximately 30 miles northeast of Baraboo. True concluded his

Fig. 4. Lellen Sterling Cheney (left) and Rodney Howard True (right) at Devil's Lake, with part of a plant press between them. A handwritten note on the back of the original picture reads: "Devil's Lake May 13. 1897 Annual Long Excursion with Pharmacy classes." This picture and Fig. 3 were a 1966 gift to the University of Wisconsin Department of Botany by Monona L. Cheney, a daughter of L. S. Cheney. From the University of Wisconsin Herbarium, Collectors' Files.

academic career at the University of Pennsylvania where he was instrumental in initiating an updated state flora (Fogg, 1982, p. 20).

Kremers was in the Pharmaceutical Department of the University and his herbarium of economic plants included some from Devil's Lake. In 1892 he expanded the 2-year course in pharmacy to 4 in pharmaceutical chemistry, the first of its kind in the United States ([Smith] 1941; Urdang, 1945).

John Ronald Heddle, a Nebraskan, is the next botanist to appear on the Devil's Lake scene. He received his Bachelor's degree in botany from the University of Wisconsin in 1910, and both the University and the Milwaukee Public Museum have Heddle specimens from Devil's Lake (1907-17), including a quillwort (*Isoetes macrospora*) and several species of Juneberries (*Amelanchier*). Heddle in more recent years was living in Racine, Wisconsin, where apparently he died in the 1970's (Mary C. Bell, Valley County Genealogical Society, Ord, Nebraska, *in litt.*).

At the time that Heddle was collecting at Devil's Lake, a committee of local citizens was agitating for a Devil's Lake State Park. On a spring day in 1907, for example, state legislators and guests had a picnic and luncheon at the lake: they listened to speeches, heard the Baraboo Marine Band, and many of them climbed the bluffs where residents pointed out choice views and rare plants (*Baraboo Weekly News,* 8 May 1907). The park was established in 1911.

In the same year that the park was becoming reality, a man was retiring as a medical doctor at age 59 and embarking on a new career—Curator of the University of Wisconsin Herbarium, a position he would hold until his death. This was John Jefferson Davis (1852-1937), who had already been collecting plants as a young man (Wadmond, 1956, p. 77). His first botanical interest was in collecting and naming seed plants he observed on his medical travels in the country, but his training as a physician led to curiosity about diseases and finally to the fungi producing the diseases (Jones, 1972). Davis (Fig. 5) brought his plant collection with him to Madison and supervised the herbarium's growth for the next quarter-century, during which time he became acknowledged as an authority on parasitic fungi. The University of Wisconsin has vascular plants, e.g. squawroot (*Conopholis americana*), collected by Davis at Devil's Lake from 1913-29.

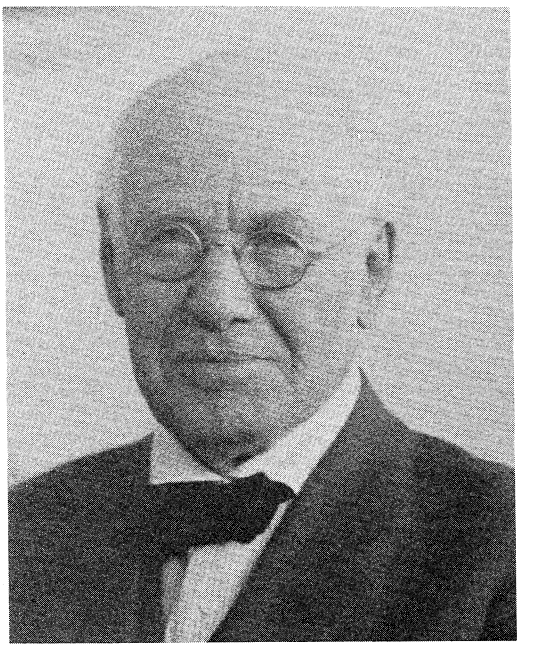

Fig. 5. John Jefferson Davis, Curator of the University of Wisconsin Herbarium, 1911-37. From the U.W. Herbarium.

Rollin Henry Denniston (1874-1957) was another University of Wisconsin figure who collected in the park, e.g. arrow-leaved violet (*Viola lanceolata*) in 1930. Denniston was an instructor in pharmaceutical botany and botany.

Albert M. Fuller (1899-1981) of the Milwaukee Public Museum was at Devil's Lake State Park on 28 July 1930, looking for ladies'-tresses orchids (*Spiranthes*), "but saw no plants" (Fuller, 1930). In the following January he was writing Norman

Fig. 6. Norman Carter Fassett, Curator of the University of Wisconsin Herbarium, 1937-54. From Taxon 4:51, 1955.

Carter Fassett at the University of Wisconsin for the ladies'-tresses orchid that "Umbach collected at Devil's Lake, Wisconsin August 23, 1900" (Fuller, 1931). Fuller's *Orchids of Wisconsin,* a Milwaukee Public Museum bulletin, was published in 1933.

Fuller joined the Milwaukee Public Museum staff in 1923, following his graduation from the University of Wisconsin, and was the Museum's Curator of Botany from 1933 until his retirement in 1964. Some of his field work on orchids was done in the Baileys Harbor area of Door County, Wisconsin, and he was much involved in the establishment of the Ridges Sanctuary there (Traven, 1981). His concern for the preservation of natural areas is evidenced by the nine years he served as Chairman of the Scientific Areas Preservation Council of Wisconsin.

Emil P. Kruschke (1907-76) was another Milwaukee Public Museum figure of these years. He was Assistant Curator of Botany from 1938-64, and Curator from 1964-74 when he retired. Kruschke specialized in the taxonomy of hawthorns (*Crataegus*), and advised poison control centers, the city health department and the police on poisonous plants. Like Fuller, he served on the Scientific Areas Preservation Council of Wisconsin (Pease, 1974; Anon., 1976). In 1933 he was at Devil's Lake State Park where he collected such plants as pale corydalis (*Corydalis sempervirens*).

As a result of correspondence in 1934 between Fuller and N. C. Fassett (Fuller, 1934), Richard W. Pohl, now Distinguished Professor and Curator of the Herbarium at Iowa State University, decided to work on the angiosperm order, Rhamnales. He attended Marquette University from 1935-39, when he was also a volunteer at the Milwaukee Public Museum. Pohl, a grass specialist, first learned to identify grasses when he worked one summer as a Civilian Conservation Corps enrollee at Interstate State Park in northwestern Wisconsin and made a few field trips to Devil's Lake State Park (Pohl, *in litt.*). The Milwaukee Public Museum has a panic-grass (*Dichanthelium xanthophysum*) collected by Pohl at Devil's Lake State Park in 1937.

Norman Carter Fassett (1900-54) followed Davis as Curator of the University of Wisconsin Herbarium. Fassett (Fig. 6) was born in Massachusetts and attended Harvard University where he studied estuarine plants for his Ph.D. under Merritt Lyndon Fernald (Peattie, 1954). Aquatic plants became an abiding interest, as he surveyed aquatic vegetation first in Wisconsin and later in Central America, and wrote *A Manual of Aquatic Plants.* His other books are *Spring Flora of Wisconsin, Leguminous Plants of Wisconsin, Grasses of Wisconsin, Ferns and Fern Allies of Wisconsin* (one of four authors) and *Hayfever Plants of the Middlewest* (one of three authors); his bibliography (Bruch and Iltis, 1966) also includes approximately 100 papers. Fassett became a leader of taxonomic thought in North America and at the time of his death was President of the

American Association of Plant Taxonomists, an organization of which he was a founder (Thomson, 1955).

Fassett was also a major figure in the conservation movement in Wisconsin (Anderson and Tryon, 1955). He sparked field botany and ecological work at the University, was active in the establishment of the Arboretum, served as the first chairman of the committee for preserving natural areas, and very likely introduced many botanical ideas to Aldo Leopold (Bean, *et. al.*, 1954; Thomson, 1955).

Fassett came to Wisconsin in 1925 as an instructor in botany. Within a year he was adding specimens to the University Herbarium from a number of places, including Devil's Lake State Park, e.g. a sedge (*Carex artitecta*) new to the park and still known in Wisconsin only from here, and Selkirk's violet (*Viola selkirkii*). The following year (1927) he found another northern violet (*Viola septentrionalis*) in the park. Fassett personally collected some 28,000 specimens for the University Herbarium, which grew several-fold during his years at Wisconsin.

Under Fassett's guidance, James Hall Zimmerman (Fig. 7) in the summer of 1946 conducted a botanical survey of the park, which included mapping vegetation, locating rare species, and recommending sensitive areas (Zimmerman, 1947). Zimmerman received a small stipend from the Wisconsin Department of Natural Resources for this project. He reported the first park records for a number of species, including a quillwort (*Isoetes echinospora*), a sedge (*Carex prasina*), two grasses (*Aristida dichotoma,* known in Wisconsin only from the park where apparently it is disjunct from central Illinois, and *Poa nemoralis*), and certain dicots; he also collected here in succeeding years. His compilation of ferns and seed plants (Zimmerman, 1962) has been the foundation of the park's current vascular species list.

Zimmerman has many fond memories of that summer. He rode the train back and forth from Madison, his home, staying in an upstairs room above the park's garage. On his first day the park superintendent drove him to the top of the east bluff and Zimmerman then proceeded to follow Fassett's advice—collect everything you don't know and also everything you think you know. By the time he staggered back with a stuffed vasculum and put the plants in a press, it was early the next morning. Thirty-five years later, Zimmerman (*in litt.*) recalled that sunny June day: "I remember seeing the Peregrine Falcons stoop from their eyrie, how the bluff looked, and many of the plants . . ."

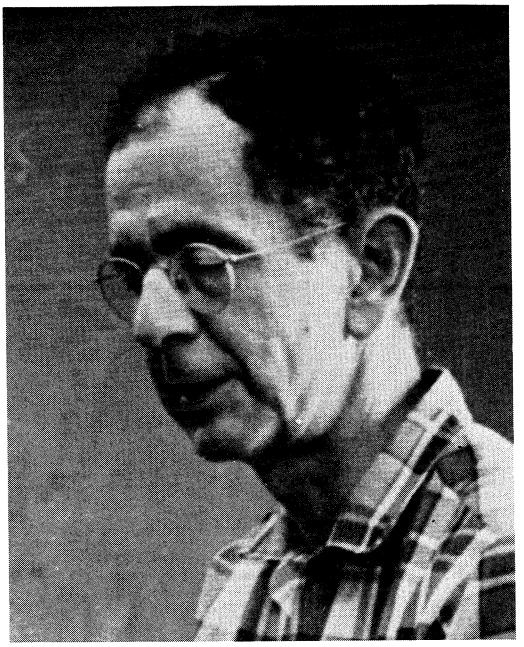

Fig. 7. James Hall Zimmerman, naturalist and consulting ecologist. Photo courtesy of J. H. Zimmerman.

Zimmerman is an instructor in the University of Wisconsin's Department of Landscape Architecture and a consulting ecologist. His current projects include sedges (*Carex*) of Wisconsin and an ecology book.

For more than half a century up to 100 or more University of Wisconsin students came to Devil's Lake State Park for a one-day field trip in the spring as a review for the

final exam in the second semester botany course. At first they came by train, but later by bus. The tradition was started by George Smith Bryan (1879-1958) of Charleston, South Carolina, who taught the course until his retirement in 1949, and was continued by Herbert M. Clarke (1909-81) of Indiana until his retirement in 1974.

Bryan, with his duck hunter's cap, was a colorful story teller with a southern accent. Former students now in their senior years continue to recall him with fondness, and this is also true of Clarke who always tried to reach each student. These leaders strove to make the field trip a true sharing experience. The class broke into groups at the park. Both faculty and teaching assistants guided in earlier years when the group was larger, but in later years with smaller groups only Clarke and one or two assistants guided. They started at the south end of the lake, along the railroad tracks, and headed for Koshawago Springs near the southwestern corner of the lake. Here they always stopped for coffee. For lunch each student brought something to share, rather than an individual meal. The instructor, Bryan or Clarke, fried small pig sausages and bacon in a 12-inch skillet. After lunch they sometimes climbed a bluff. Since the course was a survey of all plants, the students were shown examples of all major plant groups; by the springs, for example, they looked for red algae (Clarke, pers. comm.).

Botanists and other scientists continue to visit the park. Thomas G. Hartley, now in Australia with the Division of Plant Industry in Canberra, studied the flora of the driftless area for his Ph.D thesis (Hartley, 1962, 1966) and his collecting stations included Devil's Lake State Park (Hartley, 1962, pp. 126, 127). Robert C. Koeppen, now with the U.S. Forest Service in Washington, D.C., collected in the park for his report on the mints of Wisconsin. William E. Tans, then with the Wisconsin Department of Natural Resources' Scientific Areas Preservation Council, added a plant to the park's list when in 1968 he discovered the three birds orchid (*Triphora trianthophora*). Michael Nee and Robert K. Peet in 1969 found ebony spleenwort (*Asplenium platyneuron*), a new species for the park; Nee is a Botany Curator at the New York Botanical Garden, and Peet is in the Department of Botany at the University of North Carolina at Chapel Hill. Theodore S. Cochrane, a Curator at the University of Wisconsin Herbarium, collected marsh plants along the lake shore in 1975 with J. H. Zimmerman on a sedge class field trip. William S. Alverson, then with the Scientific Areas Preservation Council, made a 1981 collection of the sedge (*Carex artitecta*) known in Wisconsin only from the park. Sylvia A. Edlund studied the ecology of pale corydalis in the park (Edlund, 1970), and F. Christopher Baker surveyed littoral macrophytes in the lake (Baker, 1975). Hans Ris, a geneticist in the University of Wisconsin Zoology Department specializing in chromosomal studies, collected quillworts in Devil's Lake. W. Carl Taylor, a pteridologist at the Milwaukee Public Museum, has also collected quillworts in the lake and in 1978, with Neil T. Luebke, Assistant Curator of Vascular Plants at the Museum, found Christmas fern (*Polystichum acrostichoides*), a first record for the park. In recent years still other botanists, e.g. Philip B. Whitford and Forest Stearns of the University of Wisconsin- Milwaukee, have led field trips for school classes in the park.

Four scientific areas have been designated in the park. One of these, the Red Oak Scientific Area, was recommended by Wisconsin's pioneering ecologist, John T. Curtis (1913-61). Gary Birch, then with the Scientific Areas Preservation Council, compiled a quantitative data sheet of this scientific area in 1976, using the point quarter method of Grant Cottam and Curtis.

Another scientific area in the park is Parfrey's Glen, a narrow, rocky gorge four miles east of Devil's Lake. Its beauty and unusual plants have long attracted botanists. Among them, as determined by vascular

plant collections in the University of Wisconsin Herbarium, have been Samuel Christensen (S.C.) Wadmond of Racine, Wisconsin; Edgar T. Wherry (1885-1982) and Arthur N. Leeds (1870-1939) for the Academy of Natural Sciences of Philadelphia; Douglas W. Dunlop, now Prof. Emeritus of U.W.-Milwaukee and one of the authors of *Ferns and Fern Allies of Wisconsin*; Frederick J. Hermann, now in Fort Collins, Colorado, a moss specialist; Henry C. Greene (1904-67), who succeeded Davis as the University of Wisconsin's authority on parasitic fungi; John W. Thomson, of the University of Wisconsin-Madison Department of Botany, a lichen specialist; Hugh H. Iltis, Curator of the University of Wisconsin Herbarium since Fassett's death; Donald Ugent, Curator of the Southern Illinois University Herbarium; and Marsha Waterway, who studied clubmosses (*Lycopodium*).

The most extensive survey of the cryptogams of the park has been the study of the boulder fields of the Devil's Lake bluffs by Patricia Armstrong (1968); she found 35 species of mosses and 43 species of lichens, including a new state record, the boreal lichen, *Parmelia substygia* (Armstrong, 1970). Armstrong is an educator at the Morton Arboretum in Lisle, Illinois. Irving Halsey Black (1941) compared the mosses and liverworts on sandstone and quartzite in the Baraboo Hills, including Devil's Lake State Park; bryophytes in the park have also been investigated in recent years by Richard I. Evans, Frank D. Bowers, James A. McCleary, and (lichens also) Marietta S. Cole.

The author of this paper has been the park naturalist at Devils Lake since 1966, and has recommended scientific areas, initiated prairie restoration projects, compiled vascular plant lists for a number of park areas, added a number of species to the park's vascular plant list, including such uncommon natives as bush-clover (*Lespedeza violacea*) and purple milkweed (*Asclepias purpurascens*), and rediscovered others, notably maidenhair-spleenwort (*Asplenium trichomanes*) in 1978, which Fassett had first found in the park in 1926. An herbarium of vascular plants, mostly from the park and the Baraboo Hills, is located in the Nature Center.

Acknowledgments

Many thanks to the curatorial staffs at the herbaria of the University of Wisconsin-Madison, especially Theodore S. Cochrane, and the Milwaukee Public Museum, especially Neil T. Luebke, for all their patience with my many inquiries. James H. Zimmerman kindly shared his memories of his field work in the park, and Herbert M. Clarke, on a pleasant afternoon shortly before his death, shared his reminiscences of the botany field trips in the park. Michael J. Mossman, John W. Thomson, and Glenn Sonnedecker referred me to sources that I would otherwise have missed.

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HISTORY OF THE UNIVERSITY OF WISCONSIN ARBORETUM PRAIRIES

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The University of Wisconsin Arboretum was started with a grand and almost impossible idea—to recreate in 1200 acres the vegetation of an area extending beyond Wisconsin's borders. It was not to be merely a collection of trees and flowers in formal beds and with carefully manicured lawns. It was to be a collection of biotic communities. Aldo Leopold first gave voice to this idea at the dedication ceremonies for the Arboretum in 1934. He said the Arboretum should be a "sample of what Dane county looked like when our ancestors arrived here." (Sachse, 1965). That basic idea was subsequently enlarged to include the vegetation of the entire state, and later to include such exotic communities as Ohio valley hardwoods, and a Rocky Mountain forest complex. The initiators of this plan were undoubtedly unaware of the magnitude of the task they had set for themselves. A biotic community is an exceedingly complex thing, with thousands of different kinds of plants and animals, most of them too small to see with the naked eye but all of them influencing each other in some way. At the time of the beginning of the Arboretum, ecology at Wisconsin was in its infancy, and the knowledge of the complex communities that were to be created was grossly inadequate. Nevertheless, the basic philosophy stated by Leopold in 1934 continues today as the guiding principle on which the development of the Arboretum is based.

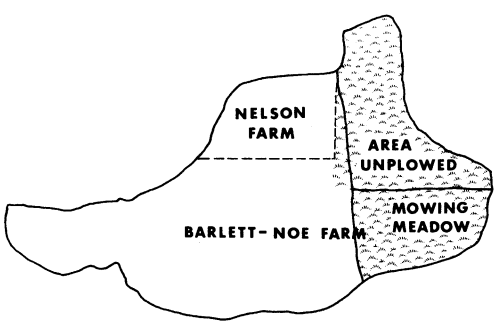

Fig. 1. Land ownership at the time of acquisition in 1932 (Curtis 1951).

CURTIS PRAIRIE

According to the original Government Land Survey records of 1835, the presettlement landscape of the Arboretum was dominated by oak openings and marsh. Large bur and white oaks were scattered over the uplands at a density of 15 to 20 trees per acre, and the ground cover was prairie grasses, prairie forbs, some shrubs and scattered oak brush or "grubs" which were mostly black oaks (Curtis 1951).

The area was first settled in 1836 and by 1860 the land had passed through eleven owners. The Bartlett family farmed the land from 1863 until about 1920 when cultivation was abandoned. Apparently, the land was regularly plowed and planted with corn, oats and pasture in rotation. This cropping seems to have been restricted largely to the western two-thirds (i.e. west of the dividing fire lane) of Curtis Prairie, while the wetter eastern third was probably not plowed. The northern half of the unplowed section, was undisturbed (or perhaps lightly grazed in dry years), while the southern half was a mowing meadow (Figure 1) (Curtis 1951).

After remaining fallow for about six years the land was leased in 1926 or 1927 to a veterinarian named West, who pastured 35 to 40 horses on the present Curtis Prairie, including the previously "undisturbed" area

and the mowing meadow, until 1932. The Bartlett farm was part of the Bartlett-Noe estate purchased by the University of Wisconsin regents for an Arboretum in 1933. A small part of the Curtis Prairie was acquired in 1932 as part of the Nelson farm (Figure 1). At the time of purchase the fields were dominated by quackgrass (*Agropyron repens*), which gave way to bluegrass species (*Poa pratensis* and *P. compressa*) within a few years.

The Prairie Experiment

The restoration of the prairies benefited greatly from the presence at the Arboretum of a Civilian Conservation Corps (CCC) camp. This camp of about 200 young men was active from 1934 to 1941 and was responsible for many of the physical structures on the arboretum and most of the early plantings. The camp was run by the army, but planning and direction of the work was the responsibility of the National Park Service, and during this period the Arboretum was officially designated a park. The Park Service hired Dr. Theodore Sperry to direct the prairie plantings. Sperry worked under the technical direction of Aldo Leopold and William Longenecker. The availability of a large labor force and trucks and other machinery enabled the prairie restoration work to be accomplished much more rapidly than would have otherwise been possible. Indeed, the methods used would have been impossible without this assistance of the CCC.

Norman Fassett is credited with being the first to have the idea for creating a prairie in the Arboretum (Thomson and Cottam 1978). In 1935 Fassett assigned two students, John Thomson and Roger Reeve, to study through a series of experiments the feasibility of prairie re-establishment on old pasture in the Arboretum.

When Fassett and Thomson began their experimental work (Reeve was apparently less involved), little was known about planting procedures for developing a characteristic complement of prairie plants in old field or meadows. The experiments were conducted mostly in upland plots near the present Leopold pines though a few plots were located in the lowlands of the prairie. At the time the experiment was initiated, the upland plots were in old pasture dominated by bluegrass, quackgrass, mullein and thistle while the lowland plots had been in corn.

The soil was prepared in three ways: 1) the ground surface was scalped (everything was removed), 2) the soil was plowed, or 3) the bluegrass sod was burned. Superimposed on the three types of soil preparation were three types of planting methods: 1) the introduction of prairie sods, 2) planting of seed, and 3) placement of prairie hay collected from area remnant prairies. In addition some small shrubs were transplanted (Thomson 1937, Thomson and Cottam 1978).

Planting materials were collected in the fall of 1935. Hay and sods were collected in a low prairie near Mazomanie, on a dry hillslope and a wet meadow between Sauk City and Mazomanie, on a dry hillslope 4½ miles west of Middleton, on the sand plains near Arena and on the sand plains northwest of Spring Green. To acquire western prairie species Dr. Fassett assisted with the collection of shrubs and seeds on the bluffs of the Mississippi River at Hager, and additional seeds were collected on the Mississippi River terraces near Lake Pepin and north of Portage (Thomson 1937).

A series of experimental plots which were usually 30′ × 30′ were established in the fall of 1937. On these quadrats different combinations of soil preparation and plant introductions were tried. Thomson summarized the experimental methods of 1937 and by then it was apparent that the best survival of plantings was with the 1935-1936 sodding technique.

The first major effort at developing a prairie was made under the direction of Dr. Theodore Sperry. A total of 42 species were planted in large pure blocks (Figure 2) by the use of seeds, seedlings and sod transplants.

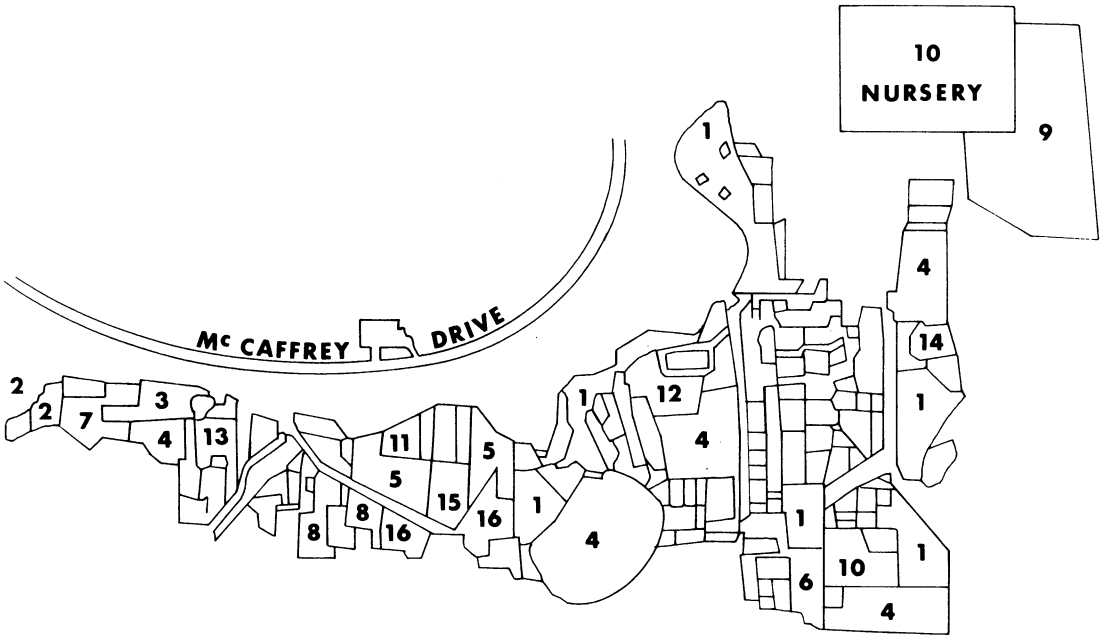

Fig. 2. Examples of Sperry's block planting of species (Arboretum file map).

1. Andropogon gerardi
2. Andropogon scoparius
3. Baptisia leucantha
4. control area
5. Koeleria cristata
6. Lepachys pinnata
7. Liatris scariosa
8. Liatris spicata
9. natural revegetation
10. nursery
11. Petalostemum purpureum
12. Solidago rigida
13. Sorghastrum nutans
14. Spartina pectinata
15. Stipa spartea
16. Tradescantia reflexa

The seeds and sods were collected from prairie remnants near the Wisconsin River (e.g. Thomson above) and seedlings were raised in nursery plots maintained within the area being restored to prairie. There is no precise estimate available of the number of plants involved in the Sperry plantings because Sperry's notes on the plantings (on file at the Arboretum) often indicate only the number of clumps, tons or truck loads. For example, over 40 tons of big bluestem (*Andropogon gerardi*) sods were transplated (Curtis 1951).

A large map detailing the planting locations of all 42 species between 1936 and 1940 was left by Sperry and is now on file in the Arboretum. In 1950 the Arboretum Botanist, David Archbald, ranked the success rate for each of the planting methods for all species (appended to Curtis 1951). The success was evaluated by plot without regard to the number of individuals planted in each plot. The success of each of the three planting methods (seeds, seedlings and sods) was very similar, but the sod technique appeared to have a slight edge. In Curtis' view the expense of the sod technique out-weighed its slight advantage over the other planting methods.

Under adversely dry conditions the sods may have the best advantage, but, as Curtis (1952) later noted, for large scale efforts such as the Arboretum projects "there is a need for inexpensive methods because of the large number of individuals" required to establish the prairie landscape. This led

Curtis to recommend broadcast seeding after spring burns as the most economical method for large scale efforts. This method, of course, is very much dependent on good weather and viable seed.

Additional planting experiments were initiated by Dr. John Catenhusen in 1942 on a 10′ × 30′ plot that was subdivided into three 10′ by 10′ blocks. These efforts consisted of direct seeding on desodded and untreated ground. In the first block only big bluestem and Indian grass (*Sorghastrum nutans*) were planted, in the second block the grasses were planted in mixture with forbs and in the third block only forbs were planted. Catenhusen left for military service and his plantings suffered the misfortunes of poor climatic conditions (McCabe 1980). Following Catenhusen, Robert McCabe was appointed Arboretum Biologist and he repeated the Catenhusen experiment on new soil adjacent to the original plot in the spring of 1943 (Figure 3). McCabe's plantings were successful and the pure grass block was eventually invaded by forbs resulting in a mixture that persists today. The mixed block did not change much except as new species entered by natural propagation. The forbs block, however, remained almost pure forbs for many years and is still identifiable today. The beneficial value of desodding was affirmed as part of the Robocker experiments (Curtis 1951, Robocker et al. 1953), but this method cannot be used without destroying already established vegetation such as the Sperry plantings.

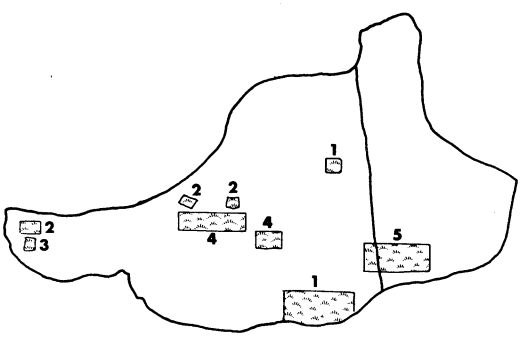

Fig. 3. Locations of some experiments: 1—Fassett and Thomson, 2—Catenhusen and McCabe, 3—Curtis and Cottam, 4—Burn plots of the 1940's, and 5—Robocker (Curtis, 1951).

Supporting Research

During the 1940's a series of research projects was conducted to learn more about the planting requirements and ecology of prairie plants. During this time Dr. Henry Greene began his large scale prairie experiment in the Grady Tract (see Greene Prairie below). McCabe remained as the Arboretum Biologist for about two and one-half years and then left for a lecture appointment at the University, but from the beginning of his appointment at the Arboretum until about 1950 he continued to conduct experiments in the Arboretum. Another of his experiments tested different methods of soil preparation before planting a mixture of prairie grasses. The test included a control (no preparation), raking the soil, burning and raking, and burning only. The combination of burning and raking the soil gave the best results for the establishment of big bluestem and little bluestem. (*Andropogon gerardi, A. Scoparius*) and Indian grass. In another unpublished experiment McCabe tested the establishment success of wild indigo (*Baptisia leucantha*) using three different seed treatments. One set of seed was treated with sulfuric acid, a second set was collected while still green in the pod and the third set was "normal" seed from the dry pods. The green seed was found to give the best germination and establishment success. McCabe hypothesized that this was an adaptation to the green pods being eaten by large herbivores such as the bison and being passed through the digestive tract before the seeds had dried in the pod.

The most significant management experiment conducted in this period was the research on the effect of fire on competition between bluegrass and some prairie plants by Curtis and Partch (1948). From 1941

through 1946 under the direction of McCabe a strict burning schedule was established for burns in March, May and October on both an annual and biennial basis. The treatment areas included both planted and unplanted prairie in 25′ × 220′ plots with adjacent controls that were not burned. After six years the density of the blue grass sod was reduced to one-fifth its original condition and bare ground was greatly increased in the burn plots. Species that were able to increase in the burn plots include the prairie perennials of rattlesnake master (*Eryngium yuccifolium),* Big bluestem, Stiff goldenrod (*Solidago rigida*) and blazing star (*Liatris aspera*) and certain weedy forbs such as ragweed (*Ambrosia artemisiifolia*), heath aster (*Aster ericoides*) and daisy fleabane (*Erigeron annuus*). Wild indigo showed no response while purple cone-flower (*Echinacea purpurea*) which is a more southern species, out of its range in Madison, was set back by fire. In this experiment the bluegrass was perceived as out-competing prairie plants for water, light and space and its removal or limitation by fire was considered necessary to reduce competition and permit other species to advance.

Further research was done by Curtis and Partch (1950) on the factors affecting flower production in big bluestem. In this study it was found that the most important factor limiting flower production was the presence of a cover of old litter on the crowns. Effective removal of this cover could be obtained either by burning or by clipping and the result was a six-fold increase in flowering and a 60 percent increase in plant height. Additional evidence on the importance of fire was found in the comparison of the Sperry plantings with the Archbald plantings of the 1950's (see below). A decade after the Sperry plantings the original planting blocks were still clearly evident while a decade after the Archbald plantings the plots were no longer distinguishable. The only treatment difference between the two plantings was the use of fire after the Archbold plantings and not after the Sperry plantings (Wilson 1964).

Between 1937 and 1948, Green and Curtis (1950) conducted germination studies on 91 species of prairie plants using seed that had been collected from southern and western Wisconsin remnant prairies. In a group of 51 species where various stratifications (cold treatments) were tested, 73 percent appeared to benefit by some stratification treatment. In a group of 12 species, mostly having hard seed coats, 83 percent were benefited by scarification techniques. Sometimes year-to-year differences were similar in both stratified and non-stratified seeds indicating that physiological conditions may be an important factor in germination success from any one year's seed crop. In general it appears that prairie grasses and composites need cold treatment or overwintering for successful germination, and most Wisconsin prairie plants are absolutely dependent on stratification.

From 1947 to 1949 Curtis and Cottam (1950) studied clones of four species of *Helianthus* (sunflowers) in the Curtis Prairie (Figure 3). Two species, stiff sunflower (*H. laetiflorus* (= *H. rigidus*)) and naked stem sunflower (*H. occidentalis*), were observed to have probable antibiotic and autotoxic effects and most other species did poorly where grown next to them. They found a reduction of flowering and vigor of bluegrass and bergamot (*Monarda fistulosa*) as well as of *H. laetiflorus* itself in the center of the sunflower clone. They concluded that the antibiotic and autotoxic effects exhibited by stiff sunflower were due to chemical toxins derived from the underground plant parts. The toxin was produced in the spring of each year during the period of most rapid decomposition of old rhizomes, and did not persist until the next year.

The Robocker experiments (Robocker et al. 1953) were another contribution to the understanding of requirements for establishing prairie plants (Figure 3). They studied grass seedling emergence and growth in the

greenhouse. Using seeds that had been dry stored, they found that the optimum planting time following harvesting was species specific. For example, little bluestem succeeded best the first year after harvest, big bluestem was more successful in the second season after harvest and Indian grass seedling production was equally successful over each of the three seasons of planting following harvest. In a field study of the effects of weed cover on establishment of prairie seedlings, they found 80 percent and 60 percent reductions in seedling density of big bluestem and switchgrass (*Panicum virgatum*), respectively, in unclipped plots compared to plots where competition was minimized by clipping.

Additional Plantings

After the first comprehensive burning of Curtis Prairie in 1950, the second major planting program was begun under David Archbald, then Arboretum Botanist. Most of the plantings were done between 1950 and 1955, but additional plantings were made through 1957. A total of 156 species were introduced into select portions of Curtis Prairie (Figure 4).

A number of methods were employed for plantings including seed casting after a burn, hand insertion of large seeds such as needle grass (*Stipa spartea*), discing with seed casting and cover crop, and importation of sods as had been done by Thomson and Sperry.

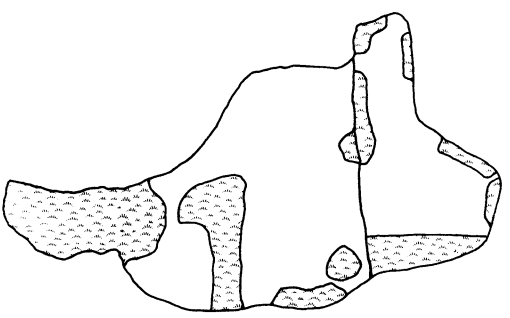

Fig. 4. Major planting areas of the Archbald years (1950-1957).

The use of stratified seed on disced ground under a cover crop gave best results (Wilson 1964). Wilson concluded that the present occurrence of species in the Curtis Prairie was due primarily to 1) the spread of existing plants following the initiation of periodic burning in 1950 and 2) the intensive planting program begun under Archbald in the 1950's.

The Contribution of John T. Curtis

Curtis became interested in the University of Wisconsin Arboretum shortly after his arrival as a graduate student in 1934, only two years after the initial property acquisitions for the Arboretum, and maintained his intense interest and concern for the development of a broad spectrum of Wisconsin and North American communities in the Arboretum until his death in 1961.

In 1937 J. T. Curtis was appointed as instructor in Botany where his research interest in orchids was reflected in his publications from 1936 to 1946. In 1939 he was added to the Arboretum staff as Director of Plant Research and member of the Arboretum Committee, serving with Aldo Leopold who was then Director of Animal Research (Greene 1961, Sachse 1965). During this time Curtis began his research on the ecology of plant communities, including some work in Arboretum forests and prairies.

Curtis's development as an ecologist in Wisconsin was interrupted by his service in Haiti during World War II, but upon his return he resumed his position in Botany and was appointed to the newly formed post of Arboretum Research Coordinator. His research in prairie ecology in the Arboretum and around the state moved into full swing with numerous papers (Curtis and Partch 1949, Curtis and Greene 1949, Greene and Curtis 1950, Curtis and Partch 1950, Curtis and Cottam 1950, Robocker, Curtis and Ahlgren 1953, Greene and Curtis, 1953). Curtis also developed a unique seed exchange with other arboreta and botanical

gardens around the U.S. and the world. Unlike most seed exchanges, Curtis' idea was to offer seeds of desirable native plants. This resulted in a great demand for Arboretum seed (Greene 1961).

Because of the many changes in staff that had taken place since the drafting of a master plan in 1939, a new master plan was issued in 1949 which covered plans for the entire Arboretum. The main objective of the new plan was the development of "an outdoor demonstration and research area in which native plants, animals and landscapes can be studied under natural or nearly natural conditions" which would provide many research opportunities for biological sciences. So as not to exclude other academic disciplines, it was also intended to provide "living models or dioramas of the pre-settlement Wisconsin landscapes for the study and inspiration of many students of art, literature, history, geography, hydrology and other disciplines outside the scope of technical biological science" (Sachse 1965). This plan also called for specific master plans for each of the major plant community projects in the Arboretum. Curtis fulfilled that requirement for the Curtis Prairie project with a detailed accounting of history, research, results and management proposals in 1951, the same year in which he achieved the rank of full professor in the Botany Department.

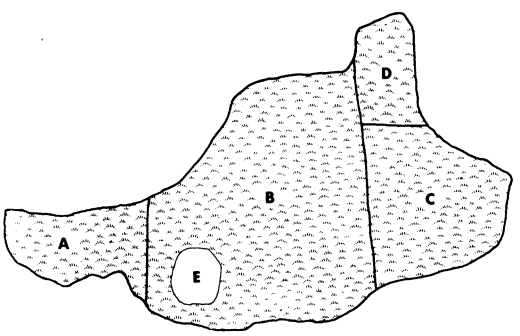

Fig. 5. Burn management units of Curtis Prairie. Unit E was a control that has been lost to the berm that has been constructed in its place.

During the 1950's Curtis was deeply involved in continued prairie restoration work and other Arboretum research projects as well as directing many thesis projects in the Botany Department. Most of these thesis projects involved the study of natural Wisconsin plant communities, from which data essential for the establishment of these com-

TABLE 1. Known burn record of Arboretum prairies from an addendum to Curtis (1951) and Arboretum files.

	Curtis	*Greene*
1950	A,B (burn units)	all?
1951	—	—
1952	C,D	—
1953	B	—
1954	A	all
1955	C,D	—
1956	B	—
1957	A	—
1958	C,D	all
1959	B	—
1960	A	—
1961	C,D	all
1962	B	—
1963	A	—
——		
——		
——		
1970	D*	—
1971	—	all
1972	A	—
1973	A,B,C,D	—
1974	B,C,D	—
1975	A	all
1976	—	—
1977	A**,B,C,D	—
1978	A,C	all
1979	A	
1980	—	—
1981	B,C	—
1982	A***	—

* October burn, other burns usually in March or April.

** Fire set by vandals burned part of A.

*** Fall burn.

Note: Beginning in 1977, a major sweet clover control experiment was conducted which involved several different burning and mowing regimes in Section B. These treatments included April, May, and Fall burns and July mowing. The experiment terminated in 1982.

munities in the Arboretum were acquired. These studies also formed the basis for his greatest work, *The Vegetation of Wisconsin,* finished in 1959. Curtis not only supervised the extensive planting work which was done by Archbald in the early 1950's, but searched the state to find prairie remnants and rare plants that might provide additional seed sources for the prairie plantings. He was helped in this search by his botanist wife, Jane Kurtenacker Curtis, and his students. Some of Curtis' students conducted their research in the Arboretum prairie, for example Dave Archbald's work on the effects of legumes on the establishment of grasses and Bonita Miller's study of differential responses of various grass species to clipping.

Using the results of the experimental work on the effects of fire in prairie restoration and management in the 1930's and 1940's a schedule of prairie burns was initiated. The first comprehensive burn was in 1950 in the western part of Curtis Prairie (A in Figure 5). Through the first decade of burning management the burn frequency for any part of the prairie, including Greene Prairie, was about three years with different parts of Curtis Prairie being burned almost every year. The record of burns can be reconstructed for the period 1950 to 1963 and 1970 to present (Table 1), but the period 1964 to 1969 was not well recorded. It was apparently during the 1960's that the burn frequency tended toward a biennial rotation rather than the earlier three year rotation.

The objectives of the burning according to Curtis' 1951 Master Plan included prevention of invasion by woody plants such as oak (*Quercus* spp), boxelder (*Acer negundo*) and dogwood (*Cornus* spp) and the weakening of the dominant blue grass sod so that native prairie species would be able to advance more readily. At the same time Curtis recognized that in addition to blue grass other problem weeds included white sweet clover (*Melilotus alba*), wild parsnip (*Pastinaca sativa*), and Canada thistle (*Cirsium arvense*) and he projected that leafy spurge (*Euphorbia esula*) could become a problem. In the plan Curtis recommended that a three year burning rotation be used. It is ironic that as the three year rotation turned into a two year rotation, white sweet clover populations seemed to be enhanced until recent efforts of Dr. Virginia Kline, Arboretum Ecologist, to resort to a more variable rotation time. The blue grass sod is gone, but the species occurs as abundant scattered individuals throughout the prairie and sweet clover, wild parsnip, and leafy spurge continue to be a problem today.

Curtis had the foresight to provide excellent documentation of the development of the prairies. In 1946 he initiated a system for surveying the two Arboretum prairies consisting of a permanent baseline from which a grid of regularly spaced quadrats could be established. Every five years since that time, the prairies have been re-surveyed. The 1946 survey was from a "closed" list, and only those species that had been planted on the prairies were surveyed. Since that time every species, including the weeds, has been recorded. Major papers reporting on the results of these surveys are those of Wilson (1964), Cottam and Wilson (1966), Anderson (1968), Anderson and Cottam (1970) and Blewett (1981). Blewett focused on identification of prairie species that appear to have the most reliable success in establishment on restored prairies. The research was also directed at identifying the environmental factors that appear to have the greatest influence in determining whether or not a planted species will survive. Some species, including yarrow (*Achillea millefolium*), little bluestem, rattlesnake master, and prairie dock (*Silphium terebinthinaceum*), were consistently successful while other prairie species, including purple coneflower and gayfeather (*Liatris pycnostachya*), did not show any pattern of success or failure. Still other species such as quackgrass (*Agropyron repens*), whorled milkweed (*Asclepias verticillata*) and cordgrass (*Spartina pectinata*) had consistent declines in their populations.

After examining a number of soil characteristics including texture, depth of the A_1 horizon, soil color, soil nutrients and pH, it was found that patterns of soil pH and long term moisture regime corresponded most closely with species distributions. Long term moisture regime was based on soil drainage characteristics which are influenced by soil texture, soil structure and topography. Soil texture alone was not a useful predicter of species distributions.

The Curtis Prairie experienced several damaging physical changes during this time. The increased drainage across the prairie resulting from construction of the beltline caused erosion problems. So serious was the problem that in 1954 one of the gullys in the west end of the prairie had to be regraded and replanted. In 1956 the beltline was widened from a two lane road to a four lane highway with a median strip. This roadwork resulted in a substantial loss of the coniferous buffer on the south side of the prairie and, worse, resulted in erosion-deposition that buried some of the prairie soil. Additional road work in 1959 again caused some runoff and erosion problems.

In 1959, just as Curtis finished his book, he was appointed Chairman of the Arboretum Committee. In this year a lime prairie project was initiated on the south side of the prairie. Limestone gravel and boulders were brought in and emplaced in a manner that might have led some to believe that there was a new gravel parking lot under construction. The work was done under the direct supervision of Ed Cawley, then Arboretum Botanist, and included the introduction of such dry lime prairie species as blazing star (*Liatris cylindracea*), pasque flower (*Anemone patens*), birds foot violet (*Viola pedata*) and silky aster (*Aster sericeus*).

In 1961 the lime prairie as well as many other parts of the Arboretum were damaged as a result of repeated "human invasions" prompted by a radio WISM treasure hunt publicity stunt. The lime prairie survived and additional plantings were made including side-oats grama grass (*Bouteloua curtipendula*), prairie dropseed (*Sporobolis heterolepis*), and little bluestem while the persistent weeds included wild (poison) parsnip and pilose aster (*Aster pilosus*).

1961 also brought a great loss to the Arboretum and the University of Wisconsin as John T. Curtis died at age 47 on June 7. The man had made monumental contributions to the Arboretum and to the field of ecology and had proposed theories about the nature of plant communities that became widely recognized and accepted.

The Curtis philosophy was not lost with his death, but was carried on by Professor Grant Cottam, successor to Curtis as Chairman of the Arboretum Committee (Sachse 1965). Under Cottam many students have learned elements of community ecology and field sampling techniques through the classes he has conducted ever since the 1950's in the Arboretum woods and Curtis Prairie. During Cottam's chairmanship the only significant impacts that affected the prairie were additional road work on the beltline highway and the building of an earthen berm to retain runoff waters and sediment from the beltline in the late 1960's. In 1976 and 1977 a utility corridor was implaced and more berm work was done.

Recent Research

During the 1960's and early 1970's more research was conducted on the establishment of artificial prairies. Cameron Wilson, who was a graduate student under Grant Cottam, began by completing the 1961 vegetation survey of the Arboretum prairies. On the basis of the 1951 and 1961 surveys, Wilson examined community dynamics in Curtis Prairie (Wilson 1964). Using Curtis' indicator species, Cottam and Wilson (1966) defined in the prairie five stands having different compositions and compared these reestablished prairie stands to native prairie stands. On the basis of prairie species, parts of the Curtis Prairie were comparable to native stands. A notable difference, however, was the greater

presence of non-prairie species in the planted prairies in comparison to the native stands. They concluded that the nonprairie species are gradually diminishing in importance and that the Curtis Prairie is becoming very similar to native prairies.

In 1969 Jerry Schwarzmeier initiated experimental plots on Wingra Overlook that were designed to test potential benefits of planting prairie seed and seedlings with companion crops (Schwarzmeier 1971, Zimmerman and Schwarzmeier, 1978). The ideal companion crop would persist for several years and provide competition for weed species, but would have minimal interference with the establishment of the prairie species. Wild rye (*Elymus canadensis*), oats (*Avena sativa*), and Indian grass were tested individually as companion crops with plantings of prairie seed and seedlings.

The experimental results (Zimmerman and Schwarzmeier, 1978) showed consistent success with mowed wild rye as a companion crop and with mowing of the weeds in planted plots that used the invading weeds as a cover crop. The oat companion crop apparently was beneficial to the establishment of most prairie species with the exception of legumes, and Indian grass was found to be too competitive to be a good companion crop. Zimmerman (1972) reported on the propagation of spring prairie plants. Four species, pasque flower, prairie smoke (*Geum triflorum*), downy phlox (*Phlox pilosa*) and shooting star (*Dodecatheon meadia*) were examined in detail.

Greene Prairie

Greene Prairie, in contrast to the Curtis Prairie, was a carefully planted prairie that evolved through the monumental efforts of a single individual, Henry Campbell Green, who almost singlehandedly planted the entire prairie. Greene came from long-established and prominent Indiana families that provided financial independence for Henry, allowing him to pursue his interests with little interruption or interference. He studied at Wabash College in Indiana for two years before moving to Washington State University where he completed first a B.A. degree and then a Master's degree in mycology in 1929. That year he came to Madison to continue his graduate studies and in 1933 completed his Ph.D. in botany (Backus and Evans 1968).

For the next few years he remained on campus conducting research on molds with people from the agriculture campus. In 1937 he accepted an instructorship in the Department of Botany at Madison which gave him staff privileges for conducting research and informally assisting graduate students without the cumbersome responsibilities of a professorship. In 1941 he was appointed Curator of the Cryptogamic Herbarium which housed one of the most distinguished collections of parasitic fungi of any state university. Dr. Greene took on the responsibility of the position with great vigor, collecting all over the state and writing nearly 40 professional papers. His uncanny ability to note detail of not only the fungi but their hosts as well led him to become expert in the flowering plants of Wisconsin in addition to parasitic fungi. In fact his knowledge of the higher plants led some taxonomists to seek his assistance in their identifications (Backus and Evans 1968).

Perhaps there was a symbiotic effect that resulted from the close association of John Curtis and Henry Greene. Both men were graduate students at approximately the same time and both were appointed to the Botany Department at about the same time. Curtis started as an orchid physiologist and Greene started as a parasitic mycologist, yet both men became significant ecologists, each in a different way. Together they began to publish their first ecological papers in the 1940's. While Curtis went on to become well known in ecological research literature, Greene became remarkably knowledgeable on the ecological requirements of individual species. Greene's abilities and commitment were clearly illustrated in his 15 year prairie

project on the Grady Tract. Greene served for many years as secretary of the Arboretum Committee and as editor of the "Arboretum News" for ten years.

A Sand Prairie Dream

Greene began to develop a compelling interest in prairies around 1940 when he was spending summers near Eagle, Wisconsin, which was located near the extensive Waukesha County prairies. These remnants of the once extensive prairie that covered southern Wisconsin impressed Greene by the variety and beauty of the vegetation in the low prairies. Together, Greene and Curtis visited these and other remnants around the state, gathering collections and observations (Anon. 1966).

Greene conceived the idea of establishing a sand prairie on the arboretum. He found a level portion of the Grady tract which was adjacent to the Lancaster Branch of the Chicago and Northwestern Railroad. This seemed an ideal place to establish an experimental sand prairie for it had many of the general attributes that Greene had observed in sand prairies. North of the opening stood a series of sand hills that were formed at the edge of a glacier and were now covered by scrub oak and some of the characteristic sand prairie species (from communication between Greene and Professor Thwaites of the Geology Department). This resulted in nearly pure sand soils on the adjacent prairie opening which sloped gently toward the south where the sand became buried by a sheet of clay. On the west end was a considerable amount of blackish sedge peat and there were several ephemeral ponds that provided refuge for some prairie plants (Greene 1949).

The original land survey records indicate that the area was originally a brushy oak opening with an understory of prairie grasses and herbs which apparently included such things as prairie dock, New Jersey Tea (*Ceanothus americanus*), ticktrefoil (*Desmodium illinoense*) and wild indigo. When the land was first viewed by Greene in 1942, it was only a few years removed from a long period of "ill-advised" attempts at cultivation. Perhaps as recently as 1937, the land was still planted in corn. There were, in 1942, protected pockets of prairie plants around the ponds and in the southeast corner where a parcel was isolated by a deep drainage ditch. In addition, the railroad right-of-way supported many prairie plants which provided more clues about the original vegetation of the area. All together, there seemed to be sources for seed that would permit the gradual re-establishment of the prairie if returned to natural conditions (Greene 1949). In preliminary vegetation surveys in 1944 and 1945 Greene listed the species present before major introductions.

In his report to the Arboretum Committee in 1944 Greene specified the terms under which he was willing to pursue the experimental establishment of a sand prairie. The project was to be exclusively Greene's and there were to be no other planting experiments on his site. He anticipated that the project would take many years of intense and careful work, and he did not want the use of unskilled labor as had been done with the CCC in the Curtis Prairie project. It was nearly 20 years before public access was provided to the interior of Greene Prairie.

The Planting of Greene Prairie

A few plants were introduced into the prairie in 1943 and 1944, but the major planting effort began in 1945 and continued until 1952. From 1953 to the early 1960's plantings were continued but gradually tapered off. The last period for which Greene left detailed notes in the Arboretum files was 1954 to 1955. The variety of planting methods used can be summarized as follows:

1) Transplanting of mature plants or sods,
2) Transplanting of seedlings started from stratified seed in the greenhouse,

3) Direct sowing or casting of seed,
   a) Planting of individual seed of large deep-rooted species such as *Silphium,*
   b) Spot planting of seed mixtures at select points,
   c) Broadcasting seed mixes over large areas after discing and then dragging to cover some seed (Anon. 1966, Green 1949).

There remained an uneven surface which resulted largely from the plow furrows, and these surfaces were intentionally left by Greene to create a diversity of microclimatic conditions that would increase the opportunities for various species to develop in suitable microhabitats (Allsup 1978, Greene 1949).

Watering was required for many of the transplants, and this was facilitated by the presence of an old well on the north side of the plantings. Greenhouse transplants included paper pot and bare root plantings, the latter requiring special attention for watering. With some of the more sensitive species such as the ladyslippers (*Cypripediums*) and gentians (*Gentiana*) mature plants in sods were carefully placed and watered to improve chances for survival (Greene 1949).

The plantings were initiated in the east end and progressed westward with a slight decrease in planting densities to the west. Much of the seeding was done with seed that Greene had collected himself. The 35 acres of the first plantings were extended to 40 acres in 1946 as the west boundary was advanced by 500 feet to the fire lane. This western segment had been cultivated up through 1946 and after haying had the usual complement of agricultural weeds such as quack grass, timothy, ragweed, red clover, alsike and others. In this western addition Greene introduced a total of 28 species by seeding in 1946 and by 1949 most species appeared to have survived (Greene 1949).

Between 1945 and 1949 about 10,000 mature plants and seedlings were planted by Greene, including a total of 133 species when all planting types are considered together. Of the 133 species, not all were planted in great numbers. The number of individuals introduced ranged from 2 small seedlings for coreopsis (*Coreopsis tripteris*) to about 1,824 more mature individuals of blazing star (Greene 1949). By 1951 Greene had planted an additional 2,000 individuals bringing the total number to 12,000 seedlings and mature plants introduced by hand (Greene 1951). This number excludes the vast number of seeds collected and cast by Greene.

In the end Henry Greene developed a preference for seed casting methods. Like Curtis he felt that the intense labor required for introducing sods or seedlings was not justified by the slight advantage in terms of survival. Some species that were started from seed such as Lupine (*Lupinus perennis*) and Indian paintbrush (*Castilleja coccinea*) have shown excellent success. Other species such as prairie drop seed and blazing star were established more successfully using seedling transplants.

It is evident from the Greene Prairie today that Henry Greene was meticulous in placing each species in the prairie so that it would have the proper set of environmental conditions for survival. True to his original word he carefully planted the entire prairie without the unskilled labor force that planted the Curtis Prairie. Greene Prairie is more spectacular than Curtis Prairie in its display of huge patches of color through the season with such species as lupines, Indian paintbrush, phlox, puccoon and blazing star. In fairness, however, it should be noted that part of the reason for the greater rate of success (at least aesthetically) with Greene Prairie over Curtis Prairie is its relative freedom from disturbance during restoration and the sandy soil types which make it more difficult for some of the weed species to persist. It has not suffered from the erosion and sedimentation caused by construction projects adjacent to its border and has not had as much visitor pressure.

Part of Greene's meticulous method was a

detailed record of his plantings. He prepared eight annual reports (Greene 1943 to 1951), one biennial report (Greene 1955), and one six-year summary report (Greene 1949). Greene mapped the prairie with a baseline and grid system that permitted him to record the location, number and type of all his plantings. So detailed is his record that one could reconstruct a data set equivalent to the prairie surveys that have been conducted on Greene and Curtis prairies once every five years since 1951.

A Study of Greene Prairie

Following the Wilson study of Curtis Prairie another of Cottam's students, Rebecca Anderson, studied Greene Prairie (Anderson 1968, Anderson and Cottam 1970). Anderson participated in the 1966 prairie vegetation survey and then in the fall of 1967 conducted a soil survey of Greene Prairie which provided information on the depth of the A_1 horizon and percent sand, silt and clay. Communities were defined on the basis of compositional indices that were calculated for each quadrat sample by using Curtis' (1959) indicator species. The dry-mesic vegetation was found to occur mostly on sandy loam while the wet-mesic to wet prairie vegetation was found on silt loam at the west end and sandy loam at the east end. Available moisture seems to have been the determining factor. Some relationship was also shown between depth of A_1 and the prairie continuum, where the shallowest A_1 occurred only under dry prairie vegetation and the deepest A_1 occurred only under the wet or wet-mesic vegetation.

An analysis of changes in frequency between 1952 and 1966 showed that groups of species within each of the wet, mesic and dry segments of the continuum had increases in frequency that were sufficient to make the species in each group most abundant within the most suitable segment of the environmental gradient. The weed species were found to disappear most rapidly from the driest sites. Anderson concluded that the Greene Prairie was not yet equivalent to a natural prairie, but was progressing toward such a state.

Conclusions

The Curtis Prairie restoration has been much more successful than it had any right to be. This was the first real effort to reconstruct a prairie and it was started at a time when little was known about prairies in Wisconsin. There was no clear picture of the species composition of the different kinds of prairies and even less was known about the life history characteristics and ecological requirements of most of the species involved. The availability of a large work force, the CCC, was mixed blessing. It provided the labor and facilities with which to accomplish a large amount of work, but it came at a time when the state of knowledge about prairie reconstruction was almost nil. Theodore Sperry, who directed the initial efforts, took a philosophical approach to the problem. He went to prairie remnants, mostly located for him by Norman Fassett and John Thomson, and literally lifted the plants out of the ground and replanted them in the Arboretum. Even more of a shotgun approach was the prairie hay experiment of Fassett. Fassett mowed prairie remnants, brought the hay back to the Arboretum, and "planted" it. The first year results were very disappointing to Fassett, but he didn't realize how slowly prairie-plants mature and the prairie hay experiments were eventually much more successful than Fassett initially believed (Sperry, 1982). There is no question that the efficiency of the restoration of Curtis Prairie would have been improved were this restoration to be started today, but for its time, the experiment was remarkably successful.

From the array of individual experiments, the conclusion seems clear that careful planting of stratified seeds on soil that has been cultivated to reduce weeds is the most economical way to re-establish a large prairie. Planting of individual prairie sods has a greater chance of success and is per-

haps the method of choice for rare or delicate plants, but it is not possible to plant a 60 acre prairie entirely by transplanting sods, since there are about one million plants per acre on a typical prairie. The major lesson to be learned from the Greene plantings is that success improves when careful attention is paid to the environmental requirements of each species. Greene's spectacular success is attributable to his meticulous matching of the plants with the environment, and also to the fact that prairie plants do relatively better than weeds on sites such as the Grady Tract that are nutrient poor and either too wet or too dry for good crop production.

The two Arboretum prairies present a marked contrast in restoration technique. The Curtis Prairie was planted in a hurry, with more than adequate labor and with a marked uncertainty about how long this labor force would be available. The Greene Prairie was planted after the Curtis Prairie and benefited from the Curtis experiment. It was planted without the massive labor input and was done with extreme care. Both methods worked and both prairies are things of beauty and rich resources for further study of the dynamics of prairies and the ecological life histories of prairie species.

Theodore Sperry, when asked how long it would take to reconstruct a prairie, answered, "about a thousand years" (Sachse, 1974). Sperry was probably an optimist. The conditions that gave rise to prairies no longer exist in the Arboretum. The Arboretum is surrounded by urban areas and bisected by a major highway. The large prairie mammals are gone, and are replaced by just one species, humans, whose impact on the prairie is entirely different than that of the large mammals. Fire, an essential component of the prairie environment in this climate, is difficult to use in the Arboretum, and the opportunity for exotics to invade disturbed areas is greatly increased. It is doubtful that it is possible to really restore a prairie in all its complexity. The best we can do is provide the higher plants, and perhaps some of the small prairie animals that cannot be expected to migrate into this isolated area, introduce enough soil in the form of sods to provide an inoculum of the microflora and fauna, and hope that this facsimile of a prairie habitat will attract the birds and invertebrates that should be there. After that, we wait. But in the meantime, the Arboretum prairies look like the real thing and they provide, for all but the most sophisticated, an experience of the presettlement landscape that is almost impossible to obtain elsewhere.

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SOIL SURFACE DYNAMICS IN SELECTED PRAIRIES OF THE ALDO LEOPOLD MEMORIAL RESERVE

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Abstract

Pedophenology is the study of the relation between seasonal climatic and biological events and periodic phenomena in the soil. Knowledge of the dynamics or the soil surface is necessary to understand the behavior of soils. Two experiments were conducted at the Aldo Leopold Memorial Reserve in which physical changes in the surfaces of soils were monitored during the summer of 1982. Short-term changes in the micro-topography and cover of the soil were studied on three prairies on the reserve. Changes in the relative frequencies of components of the soil surface (litter, plants, and bare ground) and in micro-relief of that cover were measured during four observation periods using a point frame. Because erosion and deposition were equal, there was no difference between the means of the prairies in this regard, but variances were significantly different ($\alpha = 0.10$). The point frame showed that any point may be exposed or covered with various materials over short periods, contributing stochastic effects to soil dynamics. Evidence of micro-erosion and sedimentation was observed over a nine-week period by the device of inserting nails flush with the soil surface and noting their burial or exposure. Changes observed in both experiments reflected biological and physical processes.

INTRODUCTION

Micro-topography and cover are important components of the soil environment. To examine short-term changes in the micro-topography and cover of the soil surface, I conducted two experiments on the Aldo Leopold Memorial Reserve during the summer of 1982. The first experiment employed a point frame to measure surface cover and micro-relief. The other was designed to record micro-erosion and deposition using twenty-penny (20 d) nails inserted into the soil.

To understand a terrestrial ecosystem it is necessary to understand its soil, which is the home of the detritus food chain, the reservoir of the sedimentary nutrient cycles, and an important interface between the biotic community and the abiotic environment. The ecology of the soil can be known only by studying it over time; yet such phenological studies are rare compared with such research on birds and plants.

Pedophenology is the study of the relation between seasonal climatic and biological events and periodic phenomena in the soil. One study along these lines was conducted by Nielson and Hole (1964), who examined earthworm populations and their manipulation of forest litter over time.

The surface is the most dynamic part of the soil. Here organic matter accumulates, providing energy and nutrients for a vast array of organisms. Biotic and abiotic com-

ponents lie closely intermixed. The edge effect is evidenced in the soil surface by the great quantity and diversity of organisms present.

Changes in the soil surface are the result of both biological and physical processes. Hole (1981) discusses twelve categories of animal activity that affect the soil: mounding, mixing, forming voids, backfilling voids, forming and destroying peds, regulating soil erosion, regulating movement of air and water in soil, regulating plant litter, regulating nutrient cycling, regulating biota, and producing special constituents. The effects of many of these activities are evident on the surface. The soil surface may be further altered by raindrop impact, mud cracking, and heaving caused by frost. Even over a short time the effects of these processes can be observed and analyzed to provide useful information about the soil environment.

The Study Area

The study sites were located on three restored prairies on the Aldo Leopold Memorial Reserve. The reserve is in Fairfield Township, Sauk County, north of Baraboo, Wisconsin (43°35′ N, 89°40′ W). The presettlement vegetation of the reserve is discussed by Liegel (1982).

The EBL Prairie is adjacent to the Bradley Study Center and Center Pond, off Levee Road (R. 7E, T. 13 N, Sec. 33). The original soil was a Gotham, sandy, mixed, mesic Psammentic Hapludalf (USDA 1980). This was covered by dredge spoil from Center Pond early in the summer of 1976. After draining all summer, the spoil was spread with a bulldozer to a depth of approximately one meter in the fall. In November half of the area was seeded with prairie species, each in a circular patch with a 5 m radius. The remaining area was planted to oats. In the late fall of 1977 strips of oats were disked, leaving rows of oat stubble for soil conservation. Mixed prairie seeds were then scattered across both disked and fallow areas.

East of the EBL Prairie, situated on a sandy ridge, lies the Coleman Prairie (Sec. 33). The experimental plot was located on a Plainfield loamy sand, mixed, mesic, Typic Udipsamment. Draba Prairie is located on Levee Road (Sec. 33) on a Brems loamy sand, mixed, mesic, Aquic Udipsamment. Both Draba and EBL Prairies were burned in the spring of 1982; Coleman Prairie was not.

The climate is continental. Of the 822 mm of annual precipitation, typically 60% falls from April through September. The most rain falls in June, with an average of 127 mm. As spring advances, "the frequency of precipitation is less and the intensity greater" (USDA 1980).

The Point Frame Experiment

The point frame has been employed in botanical studies to measure the relative abundance and ecological importance (as per cent cover) of plants in a community. The same instrument was used to measure changes in a Wisconsin forest soil by Nielson and Hole (1964). As with their experiment, the point frame I constructed enabled me to measure the relative frequencies of components of the soil surface and to observe temporal changes in these frequencies. In addition, I was able to measure the microtopography and its changes over time.

Materials and Methods

The key part of the point frame is the horizontal piece with its ten holes, spaced 10 cm apart. Through each hole a measuring rod is passed. The remaining parts are used to position the instrument so that the same points are sampled at each observation period. At each recording station two wooden stakes are hammered into the soil and holes drilled into the tops of both stakes. The position of these holes corresponds to two locator pins at the ends of the horizontal beam.

Before measurements are taken at each location, the apparatus is positioned so that the locator pins descend into the holes in the stakes, and the horizontal beam is levelled.

The rod is then passed through the first hole until it contacts either the mineral soil or something lying or growing on the surface. The object struck is recorded, and the distance between the horizontal beam and the top of the rod is measured to the nearest mm. The rod is passed successively through each of the ten holes. Then the sequence is repeated twice and the distances averaged. The height of the locator pins is used as a reference for comparison of measurements made at different times. After correcting for differences in the height of the horizontal beam at each observation period, and after subtracting the smallest integer for each location from all the other values from that location, this procedure yields relative values for the micro-topography of the soil surface.

Measurements were taken over four observation periods: June 23, July 7, July 28 and August 18, 1982. This experiment was conducted on the EBL Prairie alone. There were four positions, A, B, C and D, along the slope of the hillside, and there were three replicates of each position. The line that contained all three of the A positions was termed "row A," and rows B, C and D were indicated similarly. Row A was 0.5 m from the edge of Center Pond. The soil there was wetter and sandier than the other soils and supported abundant vegetation. Row B, 11 m upslope, was drier, with considerably less vegetation. Row C was 11 m further upslope. The soil contained more clay and less sand than the soil downslope. Each of these three rows was in the five year old portion of the prairie. Row D was placed in the four year old portion, 5 m from the division between the two. Except for its younger prairie vegetation and the fact that it lay on the opposite side of the hill crest, Row D was similar to Row C.

Results and Discussion

The point frame experiment yielded quantitative data (per cent cover and relative elevation), as well as a record of nominal changes. Figure 1 presents the frequency data for the distribution of bare soil, litter,

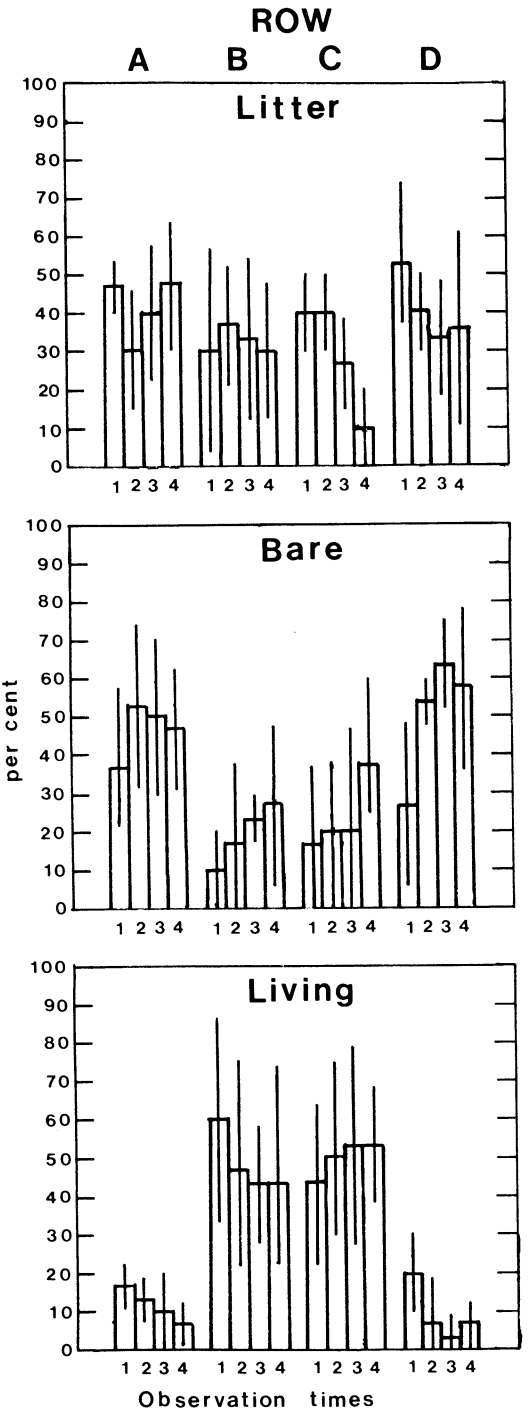

Fig. 1. Average frequencies and standard deviations of litter, bare soil and living plants contacted by the point frame rod along rows A, B, C and D. These measurements were taken during the few days on or after (1) June 23, (2) July 7, (3) July 28, and (4) August 18. (n = 3).

and living material during each of the observation periods. The term, "bare," includes mineral soil, ant hills, stones, and burnt organic matter left from the prairie fire. "Litter" includes dead plant material and occasional fragments of insect exoskeleton, and deer droppings. Grass, forbs, and moss constitute the "living" category. Each bar in the figure is the average across the row (containing three replicates of ten points each) with its corresponding standard deviation. Because most of the standard deviations are large, most of the differences are not significant, although trends are suggested.

For example, the per cent of the soil surface covered by litter declined over the summer on rows C and D, but not on A and B. The reduction on row C was significant. The loss of litter on rows C and D was accompanied by an increase in proportion of bare soil, which the litter had previously covered. Rows C and D were upslope, where vegetation was less dense than in rows A and B, indeed sometimes sparse. Exposure to direct sunlight and consequent higher temperatures at the soil surface might account for higher rates of decomposition, given adequate moisture for microbial activity. Also, the more abundant vegetation on the lower two rows yielded more dead plant material. The decrease in living plants on row B was accompanied by an initial rise in litter and, ultimately, led to exposure of the soil. Naturally, when vegetation dies, its debris remains on the surface for awhile, until broken down or removed by wind, water or animals. Row A showed a decline in living material; bare ground and litter were more variable. The results from all four rows indicate that the soil surface was most protected from erosion in June, which is the month of greatest rainfall. Bare soil, favoring increased erosion, became increasingly frequent over the summer.

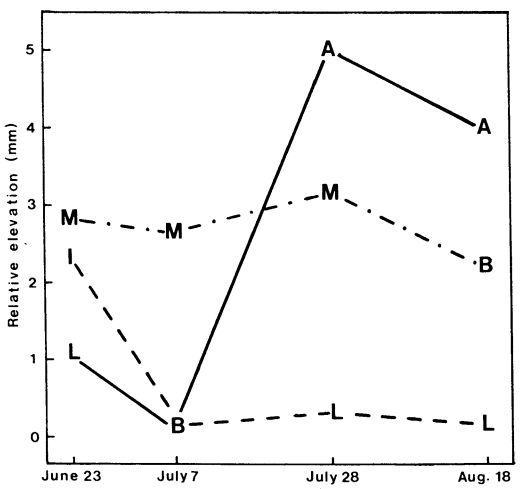

Fig. 2. Differences in relative elevation with changes in type of soil cover, (A) ant hills, (B) bare soil, (I) insect exoskeleton, (L) plant litter, and (M) moss, at three points on the EBL Prairie, BA.6 (_____), CA.2 (— — —), and CC.8 (— • —).

That the soil cover is dynamic can be illustrated by following its nominal record over time at specific locations. Figure 2 shows the changes in the cover and corresponding changes in micro-topography for three points at different stations. At BA.6 the litter that was initially present was not observed two weeks later, on July 7. This removal from the soil surface also represented a drop in elevation. Subsequently, ants, by bringing subsoil to the surface, created an increase in the micro-topography.

The interesting thing about point CA.2 is that it shows a different kind of input to the soil surface than one might normally consider. Here the rod of the point frame fell on one of the many insect exoskeletons lying on the ground, seemingly from a mass molt. These were gone on July 7 when bare soil was recorded for this point. Subsequently, plant litter covered the same point.

The very small changes in topography at point CC.8 are evidence of an important phenomenon that was occuring over large parts of the EBL Prairie: the soil's mossy mantle had dried up and was cracking. The increased elevation of the moss on July 28 was due to the rod's striking the curled, upturned edge of the dry moss. By August 18 the moss had curled to such an extent that the rod went by it and struck the bare soil that it had covered.

There were almost as many different sequences as there were points, most of which showed changes in cover over time. The types of surface changes observed may be categorized as (1) deposition (of litter, insect skeletons, and feces), (2) removal (of anything on the surface), (3) mound building, and (4) cracking and curling of mud and moss. Any given point may be successively exposed, covered, or transformed over very short periods of time. The amount and type of plant cover will affect such physical conditions as soil temperature, rate of evaporation, and erosion potential, as well as biological actions—from ant mounding to root growth. It would follow that these processes are highly variable in this young soil.

The Erosion Pin Experiment

Erosion and deposition are important in soil formation. Several researchers have measured these processes using erosion pins (Leopold, Emmett and Myrich 1966; Imeson 1971; and Imeson and Jungerius 1974). In this study erosion pins were used to determine whether the rate of surface change was affected by the age of the prairie.

Materials and Methods

I pushed each 20 d nail (10.3 cm long) into the soil until the base of the head lay against the soil surface. This was done on June 29 through July 1. Because the experiment was conducted over one summer, with only small changes expected and no danger of frost action, 20 d nails worked well. Bridges and Harding (1971), who also used nails as erosion pins, noted that the nails rusted sufficiently to form an effective bond with the soil, which helped to reduce disturbance.

The erosion pins were placed along four transects, parallel to the contours of the hillsides: the five and four year-old portions of the EBL Prairie (rows C and D, respectively), Draba Prairie, and Coleman Prairie. On each transect were five replicate clusters of nails. The clusters were arranged in a rectangular pattern, which facilitated finding the nails at the end of the experiment. Rows C and D of the EBL Prairie had similar slopes on opposite sides of the crest of the hill. The transect on Draba Prairie was similar to those of the EBL Prairie with respect to slope and proximity to the crest of a gentle rise. The slope of the Coleman Prairie was slightly greater than the others. In contrast to the EBL Prairie, which had been recently planted on a newly-created soil, Draba and Coleman Prairies had supported prairie vegetation for a considerably longer time and had been managed as prairies since 1968. The amount of erosion or deposition was measured to the nearest mm on September 7.

Results

Although the means of data sets for the four transects are essentially the same, dissimiliarities in the ranges of values cause differences among the variances. According to the analysis of variance (Table 1), there is no evidence to reject the hypothesis that the means are equal. Furthermore, one can see from Table 2 that the standard deviations

Table 1. Analysis of variance for the erosion pin experiment.

Source	*df*	*SS*	*MS*	*F*	*Significance*
Replicates	4	12.33	3.08	.285	NS $\alpha = .005$
Treatments	3	27.52	9.17	.849	NS $\alpha = .005$
Experimental Error	12	129.62	10.80		
Sampling Error	180	827.87	4.60		
Total	199	997.35			

Table 2. Means ($\bar{x}$) and standard deviations (S_x) of erosion pin measurements (n = 50).

Prairies	$\bar{x}$ *(mm)*	S_x
EBL row C	−0.18	2.64
EBL row D	−0.09	2.59
Draba	0.46	1.89
Coleman	−0.58	1.37

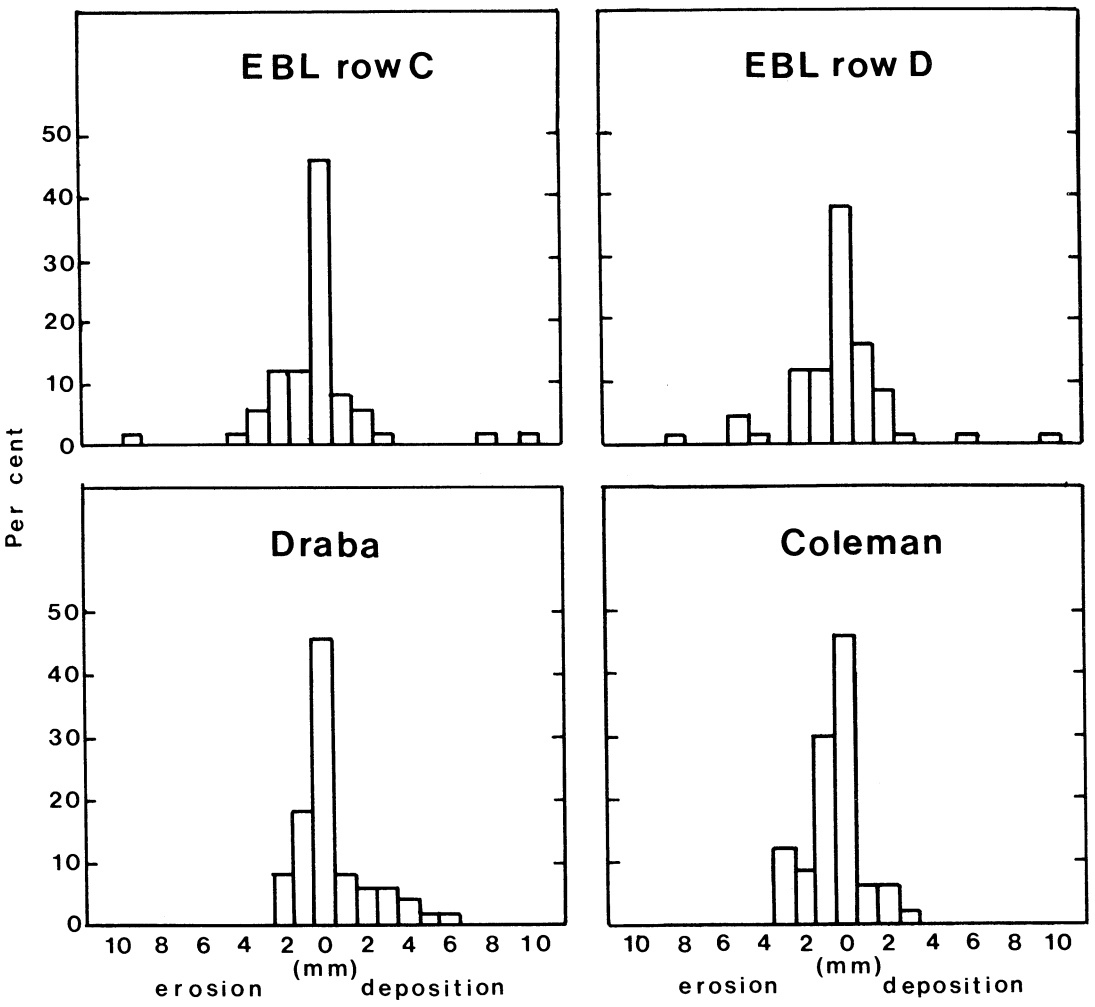

Fig. 3. Frequency of various amounts of erosion and deposition recorded by the erosion pins on each transect (50 nails per transect).

are greater than the differences between any of the means. The means are all close to zero, indicating that on each transect erosion and deposition were nearly equal. The most commonly observed event, as shown by the histograms in Figure 3, is no change. Despite the similarity of the means, Figure 3 suggests differences among the variances. The range of values for erosion and deposition is much greater on the two rows of the EBL Prairie than on the other two prairies. Indeed, the chi-square test of the homogeneity of variances indicates differences at the 10% level of significance.

Discussion

It is generally agreed that erosion is greatest on bare soil. In plotting surface erosion and deposition against vegetation height, Imeson (1971) notes that the greatest variability is found where the vegetation (in his case, *Calluna vulgaris* L.) is the shortest, an observation which Imeson attributes to the more variable amount of soil cover in the

young, short stands. Others (Bridges and Harding 1971, and Imeson and Jungerius 1974) report that erosion is limited to unvegetated areas. Vegetation protects the soil, they say, by absorbing the kinetic energy of falling rain, which otherwise would be sufficient to dislodge and move soil particles.

The unvegetated area need not be large for erosion to occur. Imeson and Jungerius (1974) state that the only parts of their forest experiencing measurable erosion are the small areas exposed by animal activity, in their case moles and wild pigs. On prairies the mound-building activity of ants can be significant (Baxter and Hole 1967). Although these ants expose patches of soil to rain drop impact, they also increase the porosity of the soil, which reduces the amount of water flowing over the soil surface after a rainfall. The mounds and tunnels of ants and moles were evident on all four of my sites. The most commonly measured effect of ants in this experiment was the deposition of soil on the erosion pins.

To a greater extent than the activity of ants, the degree of prairie development seemed to bear on the amount of exposed soil. Whereas the older prairies, Draba and Coleman, were well covered by vegetation and plant litter, the younger EBL Prairie was spotted with numerous bare areas. The irregular cover of the EBL Prairie correlated with the greater variance in erosion and deposition there.

While it is not statistically significant, there is an apparent trend toward slightly greater net erosion on the Coleman Prairie than on other sites (Table 2 and Figure 3), which may be related to the fact that Coleman Prairie has a greater slope. Draba Prairie shows a tendency toward more deposition, although, again, this trend is not significant.

Many of the recorded losses on the EBL Prairie were due to the formation of dessication cracks in the soil. The depth of some of the cracks contributed to the variability of the data for these two transects.

One might expect to find increased erosion due to exposure of the soil immediately following a prairie burn. To observe this effect it would be necessary to carry out this experiment shortly after the fire. By the time my experiment was initiated, the prairie species were growing in both the burned and unburned sites, and no difference was observed between the two with respect to means or variances.

Conclusions

Interesting in themselves, these phenological observations of the soil surface have ecological implications. For example, with regard to the interaction of the biotic community with its physical environment several examples were noted. For instance, the vegetation shields the soil from the impact of falling rain. The soil, in turn, acts as substrate for plants and animals. Ants and moles acted as soil mixers and tunnelers that created conduits for air, water and various soil animals.

Primary succession was also observed on the soil that was dredged from the pond. Moss began to grow on previously bare soil. Older patches of moss dried out and cracked, and higher plants sprouted in the fissures.

Evidence of nutrient cycling was recorded. The deposition of plant litter and wastes of animals and insects was followed by their subsequent disappearance. The decomposition of the organic matter represents the release of nutrients and energy.

These processes occur over time. Therefore a phenological approach to their study is appropriate. By careful observation the dynamic nature of the soil surface is noticeable over relatively short periods of time.

Acknowledgements

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PHYTOCHEMICAL AND MORPHOLOGICAL DIFFERENTIATION BETWEEN *MYRIOPHYLLUM SPICATUM* L. AND *MYRIOPHYLLUM EXALBESCENS* FERN IN TWO WISCONSIN LAKES

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Abstract

M. spicatum and *M. exalbescens* from a common environment were successfully separated using phytochemical techniques and by using the morphological characters of leaf length and numbers of pairs of leaflets. An ordination technique using 25 morphological characters could not successfully separate the two species.

INTRODUCTION

Fernald (1919) described *Myriophyllum exalbescens* Fern as a species distinct from *Myriophyllum spicatum* L. However, Patten (1954) and Nichols (1975) have shown that the two display great phenotypic plasticity and are very difficult to differentiate using morphological characters. Jepson (1925) and Fernald (1945) reduced *M. exalbescens* to a variety of *M. spicatum.*

More recently Aiken (1981) is convinced of the distinction between the two species and she found that *M. exalbescens,* previously thought to be a North American species, exists in northern Europe (Aiken and McNeill, 1980). In addition, Ceska (1977) has developed chemotaxonomic techniques which separate the two species.

Aiken and Picard (1980) believe that most of the phenotypic plasticity documented by Nichols (1975) could be explained by habitat variation. This is a valid observation as the plants collected by Nichols were collected from three different lakes and from different habitats within those lakes.

Based on past collections and observations, Fish Lake and Lake Wingra in Dane County, Wisconsin "were thought to" contain populations of both species growing in close proximity to each other so that the morphology and phytochemistry of plants from a common environment could be compared. The question to be answered is whether the *M. spicatum* and *M. exalbescens* like plants from a common environment are morphologically and phytochemically distinct. If the plants are distinct, variations previously observed could be attributed to the environment. If they are not distinct, the variations are attributed to other causes.

METHODS

A mass collection of Lake Wingra milfoil plants already existed in the University of Wisconsin herbarium. This collection was made by the author on August 5, 1970 from a common depth, over a common substrate, and from an area about 10 m in diameter. A similar collection was made from Fish Lake on July 7, 1982 from a common depth, substrate and from an area about 10 m in diameter. From field observation both collections were throught to contain both *M. spicatum* an *M. exalbescens* plants. The plants were at similar stages of their life cycle when they were collected (i.e. they were mature plants with flowering spikes).

The morphological characters of all suitable plants were measured according to the criteria used by Nichols (1975). A total of 28 specimens were analyzed. These specimens were ordinated on a two axis, R type ordina-

tion using the Axis I and Axis II R values developed by Nichols (1975) for each character.

The ordination array for each lake was divided into quarters and one specimen from each quarter was selected for chemotaxonomic studies. Initial positive results from Lake Wingra caused the selection of four more specimens from the center of the Lake Wingra ordination. In total 12 specimens were sent to O. Ceska, of Ceska Geobotanical Research Co. Victoria, British Columbia to analyze the phytochemistry of the plants using techniques which she developed (Ceska, 1977).

Aiken and Pickard (1980) state that mean internode length, mean leaf length and mean number of leaf divisions can be used to separate the two species from a common environment. Since mean values of the characters for these specimens were not calculated in a fashion similar to Aiken and Picard, leaf length, numbers of pairs and leaflets, and internode lengths as described by Nichols (1975), and combinations of these characters taken two at a time were displayed graphically along with an R-ordination of the 12 specimens to see if they correlate with results from the phytochemical analysis.

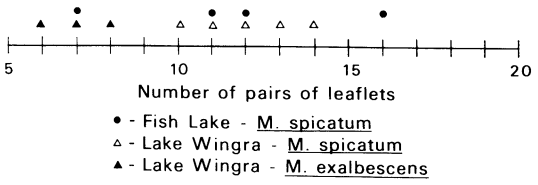

Fig. 1. Numbers of pairs of leaflets for selected *Myriophyllum* plants.

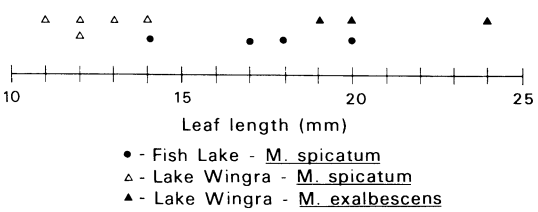

Fig. 2. Leaf length of selected *Myriophyllum* plants.

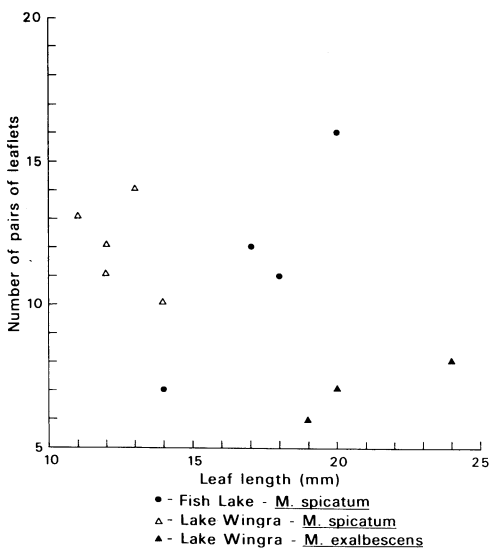

Fig. 3. Leaf length vs. number of pairs of leaflets for selected *Myriophyllum* plants.

Results

Ceska (in. Litt.) reported that all the Fish Lake samples were *M. spicatum* but that three of the eight Lake Wingra samples were *M. exalbescens.* In addition she reported that the differentiation between the two

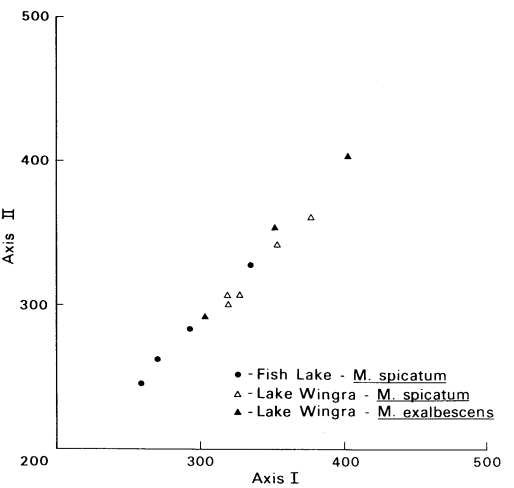

Fig. 4. R type ordination of selected *Myriophyllum* plants based on 25 morphological characters.

species in Lake Wingra was distinct. There was no appearance of intergradation of phytochemical characters (chromatograms are on file at the author's office).

Leaf length and number of pairs of leaflets were both useful characters for separating *M. spicatum* from *M. exalbescens* from a common habitat (Figures 1 and 2). The plot of leaf length vs. number of pairs of leaflets successfully separated *M. exalbescens* from all *M. spicatum* plants (Figure 3).

Ordination was not a successful method of separating the species. The two species from a common habitat could not be separated using this technique (Figure 4). In fact *M. exalbescens* plants occupy both ends of the Lake Wingra ordination.

Likewise internode length was not a good separating character. Used alone it couldn't separate the two species from a common habitat and when used with either leaf length or pairs of leaflets it would separate the species from a common environment but it would not separate *M. exalbescens* from all *M. spicatum* plants.

Using the limited number of samples available the ratio of leaf length divided by numbers of pairs of leaflets was calculated. The mean and 95% confidence limits were 3.0 ± 0.5 for *M. exalbescens* and 1.3 ± 0.3 for *M. spicatum*. These means were significantly different at the 95% confidence level using a Student's T test.

Discussion and Conclusions

This study showed that at least during 1970 there were two distinct species of milfoil present in Lake Wingra. These species were phytochemically and morphologically distinct. Whether both species still exist together in Dane County lakes is open to question. The author searched lakes Wingra, Mendota, Monona, Waubesa and Fish during the summer of 1982 looking for both species. Fish Lake was the only place both species appeared to be growing together. Phytochemical analysis showed that these specimens were all *M. spicatum*. If the author had not spent a great amount of time on Lake Wingra during the summer of 1970 he probably would not have discovered the *M. exalbescens* because its growth was extremely limited. In addition the author searched Lake Wingra and Fish Lake for milfoil turions in mid-April, 1984. Turions would indicate the presence of *M. excalbescens*. No turions were found.

These findings concur with Aiken and Picard (1980) that leaf length and numbers (or pairs) of leaf divisions are useful characters for separating the species. It is interesting to note that Aiken and Picard found that *M. exalbescens* leaves were shorter than *M. spicatum* leaves. This study showed just the opposite.

The ratio of leaf length divided by the number of pairs of leaflets might be a useful criterion to use for separating the species. This criterion would have to be developed by measuring a large number of plants that were known to be from each species from a broad geographical range. The numbers and geographical range of the plants used in this report are much too limited to be considered representative.

This study also shows that the ordination technique based on 25 morphological characters is not a useful technique for separating the species. These characters are apparently too variable to be useful. This variability is not entirely environmental, however, as the ordination technique could not separate the two species from a common habitat.

In conclusion it appears that *M. spicatum* and *M. exalbescens* from the common environment studied can be separated phytochemically and by using the morphological characters of leaf length and numbers of pairs of leaflets. The variability of many morphological characters of plants from a common environment is such that they are not useful in separating the species using ordination technique. Much larger populations of known plants will have to be examined to see if leaf length and leaflet pair

criteria can be developed which can be used to separate the species over a broad geographical range.

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THE CADDISFLIES (TRICHOPTERA) OF OTTER CREEK, WISCONSIN*

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Abstract

By collecting and rearing larvae, sweeping bank vegetation, and using a black-light trap, 79 species or genera of caddisflies were identified or tentatively identified from collections made at Otter Creek. We believe that all except 9 may have developed in the stream. Six species, *Hydroptila valhalla, H. virgata, Oxyethira anabola, Lepidostoma libum, L. vernale,* and *Triaenodes dipsius* have not been recorded previously from Wisconsin. Most species are univoltine with relatively short emergence periods, but several have many cohorts and extended emergence periods.

INTRODUCTION

Caddisflies or Trichoptera are insects with aquatic larvae, aquatic pupae, and terrestrial adults. They comprise one of the largest orders of aquatic insects. Within the United States there are 18 families, 142 genera, and at least 1213 species (Merritt and Cummins, 1978). Wiggins (1977) estimated more than 10,000 species worldwide. Based mostly on studies by Longridge and Hilsenhoff (1972, 1973), Hilsenhoff (1981) reported 16 families, 71 genera, and 218 species from Wisconsin.

Trichoptera are holometabolous with five larval instars, and most species are univoltine. The larvae are known for their variety of cases, although some build nets and retreats instead. Through a small opening at the tip of the labium caddisfly larvae emit silk that is used either to cement together cases or to construct nets and retreats. Cases aid in respiration, protect against abrasion, and provide camouflage to protect from predation. Nets are used as retreats or to collect food from flowing water. Caddisfly larvae have evolved to exploit resources in a variety of running and still waters ranging from cool to warm streams, and from lakes and permanent ponds to temporary ponds (Wiggins 1977). Because of this broad diversification, caddisfly larvae are important indicators of water quality, as well as an important source of food for fish.

Adults are cryptically colored and resemble moths, but their wings have hairs instead of scales, hence their name Trichoptera (trichos = hair, ptera = wings). They are relatively short-lived, with most species living less than a week or two. Some species may feed, but most only drink water. They are active at night, and most species are attracted to lights, but during the day they are inactive and stay in cool areas. Eggs are laid in masses in or above the water.

Previous collections indicated that Otter Creek has a diverse caddisfly fauna. The purpose of our study was to determine the species of caddisflies and their distribution in this small, spring-fed, woodland stream on the south slope of the Baraboo Range in south-central Wisconsin. Otter Creek has excellent water quality and is one of the cleanest streams in southern Wisconsin (Hilsenhoff 1977). Because of this and other considerations, The Nature Conservancy has purchased much of the land through which the headwaters flow to protect it for future generations.

* Research supported by the College of Agricultural and Life Sciences, University of Wisconsin-Madison.

Within North America in recent years there have been several similar studies of caddisflies in streams or small watersheds. The objectives of these studies have varied as have techniques used to sample the caddisfly fauna. Larval collections have been frequently used (Mingo *et al.* 1977, McElravy and Foote 1978, Karl and Hilsenhoff 1979, Mingo and Gibbs 1980), but only about 39% of the larvae of North American caddisfly species are known (Wiggins 1977). Rearing larvae to the better known adults, supplemented by net collections of adults (Karl and Hilsenhoff 1979, Mingo and Gibbs 1980), or net collections of adults from along the stream (Ellis 1962, Mingo *et al.* 1977), are other techniques that have been used, but some species are difficult to capture by these methods. Light-traps, especially those using black-light, were employed by Ellis (1962), Resh *et al.* (1975), McElravy and Foote (1978) and Morse *et al.* (1980) to capture adult caddisflies from streams being studied, but there are two serious problems with relying on this technique. Some species are not attracted to light and most are excellent fliers that disperse widely, so that individuals from nearby streams, ponds, lakes, and marshes may be captured along with those from the study stream.

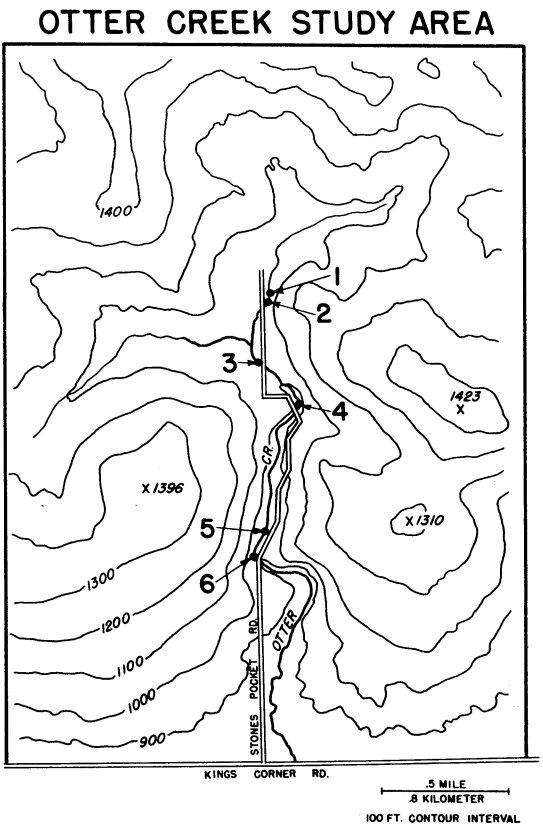

Fig. 1. Location of sampling sites.

Emergence traps placed over the stream provide a technique that assures capture of adult caddisflies from the study stream (Corbet 1966b, Anderson and Wold 1972, Flannigan 1977, Mingo and Gibbs 1980, Masteller and Flint 1980). The only problem with this technique is vandalism to the large and conspicuous traps, and this is often so serious that it precludes the use of traps on streams frequented by the public. In any study, however, it is advantageous to use as many collecting techniques as possible.

Materials and Methods

Our study was conducted on the headwaters of Otter Creek in the northeast corner of Wisconsin's driftless area (T11N, R6E, S-28, 29, 32, 33). This stream descends rapidly, 107 m in 4 km (Narf and Hilsenhoff 1974), from the Baraboo Range onto a flat outwash plain and then flows south about 25 km into the Wisconsin River. The substrate of the creek varies from muck, sand, and accumulated vegetative debris in pools, to boulders, cobbles, pebbles, gravel, and sand in the riffles. Water depths and stream widths depend upon the season and rainfall. Otter Creek is a soft-water stream with low total alkalinity (16 ppm), low total nitrogen (0.30 ppm), low total phosphorous (0.03 ppm), low total solids (62 ppm), and a pH varying from 6.3-7.3 during the year (Hilsenhoff 1977).

Six sampling sites were chosen to represent various ecological habitats within the stream (Fig. 1). *Site 1* is a 6 m long spring seep that feeds into Otter Creek. It flows out between

two large sandstone boulders under a large oak tree, dropping 1 m over its 6 m length. The average width and depth are 0.4 m and 5 cm respectively. The substrate is predominantly fine sand and muck with scattered 5 to 12 cm cobbles. Leaf packs line the margins, with up to 20 cm of oak leaves covering the seep in the fall. *Site 2* is a 50 m portion of the creek above and below site 1. Its average width is 4 m and average depth 15 cm, with riffles predominating over pools. The substrate consists of scattered boulders, cobbles, pebbles, gravel, and sand, with leaf mats tending to wedge between larger rocks. *Site 3* is 20 m upstream from the third bridge north of Kings Corner Road. It is dominated by pools averaging 5.5 m wide and 0.5 m deep. The substrate is fine to coarse sand and muck with accumulations of tree branches and logs along the margins. *Site 4* is 10 m upstream from the second bridge north of Kings Corner Road. It is a 3 m wide rocky riffle composed mostly of 12 to 25 cm cobbles, with an underlying substrate of coarse gravel and sand. Leaf packs are common between the rocks. The average depth is about 15 cm. In the fall, filamentous green algae occurs at this site as well as at sites 2 and 3. *Site 5* is a 50 m long run with scattered riffles and is located at a wayside about 0.2 km north of the first bridge. The predominant substrate is large boulders with gravel and sand along the bottom. Leaf packs are numerous along the margins and the tree canopy is more open than at other sites. It is the widest (about 8 m) and deepest site (0.6 m average). *Site 6* is 6 m upstream from the first bridge north of Kings Corner Road. It has a moderate deciduous tree canopy. Most samples were taken from a riffle with large boulders, cobbles, leaf packs, and a sand and gravel base. Shallow pools are located just above and below the riffle. The average width is about 5 m and average depth about 0.4 m.

Using a D-frame aquatic net with 0.7 x 0.9 mm mesh openings, larvae were collected from each study site every two weeks from 19 March 1980 to 14 September 1980, and monthly from 17 October 1980 to 31 March 1981. Samples were collected from riffle, pool and bank areas at each site. Large rocks and logs were inspected, and caddisfly larvae were removed. Larvae from each site were preserved in a single jar of 70% ethanol and returned to the laboratory for identification and enumeration.

From 2 April 1980 to 14 September 1980, a second set of larval samples was collected at each site. This composite of riffle, pool, and bank samples was placed in a polyethylene bag half-full of water, leaves, and aquatic vegetation. In addition, one or two 2-gallon polyethylene pails were filled 3/4 full with typical substrate and aquatic vegetation from the site. Both pails and bags were returned to the laboratory in large coolers containing ice to keep the organisms cool. Approximately 120 liters of stream water were also returned to the laboratory.

Upon returning to the laboratory, substrates from each site were put into a 10-gallon glass aquarium along with enough stream water to fill the aquarium 3/4 full. Predators that were seen were removed. The substrate covered about the bottom 5 cm of each aquarium and was arranged to simulate the stream bottom, with additional vegetation or rocks piled above the water to aid emergence. The contents of the polyethylene bags were then gently poured into each aquarium. A high flow of compressed air through two air stones at one end of each aquarium provided water movement and oxygenation. A screen was placed over each aquarium to retain emerged adults.

The aquaria were maintained at a temperature and photoperiod similar to that of Otter Creek. Material from each sample date was usually reared for 2 months, after which the aquaria were cleaned and remaining caddisfly larvae were preserved in 70% ethanol.

During each visit to Otter Creek, about 10 minutes were spent at each site collecting adult caddisflies with a 30.5 cm diameter

sweep net. Tree bark, large rocks and undersides of bridges were visually checked for adult caddisflies. All adults were preserved in 70% ethanol for later identification.

A black light was used every two weeks during the summer of 1980 to trap adult caddisflies, mostly at Site 4. A 6-watt blacklight (G.E. F6T5/BL) was placed in the center of a 24 x 21 cm baffle attached above a 20 cm diameter funnel below which a pint mason jar containing 70% ethanol was attached. A 12 volt car battery, which was kept inside a 10-gallon trash can, provided electricity. The light-trap was set on top of the trash can at the midpoint of a white twin-sized bed sheet stretched between two poles. It was turned on about 1/2 hour before sunset and run about 4 hours. Caddisflies flying down the funnel were trapped in the alcohol, and aspirators were used to collect them from the sheet. They were also collected by sweeping vegetation around the sheet and along the creek.

Larvae and adults in the University of Wisconsin Insect Collection that were collected from Otter Creek between 1963 and 1979 were also examined. Most adults had been reared by Richard Narf during his study of the stoneflies (Narf and Hilsenhoff 1974), and most larvae had been collected by students taking the aquatic insects course. Wayne K. Gall loaned to us additional larvae and adults from his personal collection.

Results and Discussion

Seventy-nine species or genera were identified or tentatively identified from collections made at Otter Creek (Table 1). This represents more than one-third of the species known to occur in Wisconsin (Hilsenhoff 1981). Six of them, *Hydroptila valhalla, H. virgata, Oxyethira anabola, Lepidostoma libum, L. vernale,* and *Triaenodes dipsius* are new records for Wisconsin. In addition, a female *Pseudostenophylax* was reared and tentatively identified as *P. sparsus,* which would also be a new record for Wisconsin. It differed from two other females we tentatively identified as *P. uniformis.* Unfortunately larvae and female adults of many caddisfly species cannot be identified, and male adults frequently had to be relied upon for positive identification.

In addition to the 43 species positively identified from Otter Creek as larvae or reared adults, larvae of at least 6 more

Table 1. Occurrence of species of Trichoptera at Otter Creek.

Species	*Collections*	*Number*	*Dates*	*Habitat*
HYDROPSYCHIDAE				
Cheumatopsyche spp.	larvae	464	year-around	throughout stream
Wallengren, 1891				
Cheumatopsyche gracilis	reared	22m 11f	18May-09Jul	boulder riffles
(Banks, 1899)	light-trap	41m 598f	05Jun-02Sep	at site 6
Cheumatopsyche oxa	reared	19m 13f	09May-29Aug	rock riffles
Ross, 1938	light-trap	22m 368f	25Jun-02Sep	at sites 2 & 4
Cheumatopsyche pasella	light-trap	1m 1f	09Jul,14Aug	
Ross, 1941				

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
Cheumatopsyche pettiti	light-trap	9m 23f	05Jun-19Aug	
(Banks, 1908)				
Diplectrona modesta	larvae	90	08Jul-24Apr	rock riffles at
Banks, 1908	reared	1m	28May	site 2
Hydropsyche betteni	larvae	71	27Aug-18Jun	rock, boulder
Ross, 1938	reared	1m 1f	25Jul	riffles at
	light-trap	8m 98f	05Jun-02Sep	sites 2 & 6
	sweep	1m	12Jun	
Hydropsyche bidens	light-trap	1m 1f	05Aug,05Jun	probably from
Ross, 1938				Wisconsin River
Potamyia flava	light-trap	1m	05Aug	probably from
Banks, 1900				Wisconsin River
Ceratopsyche bifida	light-trap*	2f	25Jun	
(Banks, 1905)				
Ceratopsyche bronta	light-trap	2f	09Jul	
(Ross, 1938)				
Ceratopsyche riola	larvae	185	12Jul-23May	rock riffles at
(Denning, 1942)	reared	1m	27May	sites 4 & 6
	light-trap	7m	05Jun-22Jul	
Ceratopsyche slossonae	larvae	821	year-around	rock, boulder
(Banks, 1905)	pupae	2m	04Jun,02Jul	riffles at
	reared	34m 37f	28May-22Aug	sites 2-6
	light-trap	55m 614f	05Jun-02Sep	
Ceratopsyche sparna	larvae	20	24Jul-20Jan	rock riffles at
(Ross, 1938)	reared	1f	24May	sites 2 & 4-6
	light-trap	2m 54f	05Jun-19Aug	
	sweep	1f	23May	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
PHILOPOTAMIDAE				
Chimarra aterrima	larvae	556	year-around	rock, boulder
Hagen, 1861	pupae	1m 1	31Jul-14Aug	riffles at
	reared	7m 9f	30May-18Aug	sites 2 & 4-6
	light-trap	2m 3f	05Jun-19Aug	
	sweep	56m 60f	25May-08Sep	
Dolophilodes distinctus	larvae	22	03June-14Jun**	
(Walker, 1852)	light-trap	1m	19Aug	
	sweep	1m	19Apr	
POLYCENTROPODIDAE				
Nyctiophylax moestus	larvae	5	24Apr-02Aug	pools, reduced
Banks, 1911	reared	3f	30Jun-13Jul	current at site 2
	light-trap	250m 936f	05Jun-19Aug	
Phylocentropus placidus	light-trap	9m 7f	05Jun-19Aug	sites 1 & 3
(Banks, 1905)	sweep	1m 2f	04Jun-18Jun	
Polycentropus aureolus	light-trap	1m	09Jul	
(Banks, 1930)				
Polycentropus centralis	larvae*	13	02Jul-02Apr	riffles at
Banks, 1914	light-trap	82m 84f	05Jun-02Sep	sites 2-4
	sweep	1m 1f	02Jun,18Jun	
Polycentropus flavus	larvae*	9	05Nov-19May**	
(Banks, 1908)				
Polycentropus pentus	reared	1m	08Sep	pools at site 3
Ross, 1941	light-trap	5m 7f	05Jun-05Aug	
Polycentropus remotus	larvae*	5	31Aug-20Apr	pools at
Banks, 1911				sites 2 & 3

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
PSYCHOMYIIDAE				
Lype diversa (Banks, 1914)	larvae	18	27Aug-18Jun	decaying wood at
	reared	4m	11Jun-01Jul	site 3
	reared (6-Mo.)	49m 20f	17Dec-23Apr	
	light-trap	13m 22f	05Jun-09Jul	
	sweep	16m 15f	04Jun-18Jun	
Psychomyia flavida Hagen, 1861	larvae	1	19Mar	boulder riffles
	light-trap	197f	05Jun-02Sep	at site 6
	sweep	3f	12Jun-18Jun	
GLOSSOSOMATIDAE				
Glossosoma intermedium (Kapalek, 1892)	light-trap	1m 3f	04May-05Jun	
Glossosoma nigrior Banks, 1911	larvae	1031	year-around	rock riffles in
	reared	116m 112f	30Apr-19Sep	moderate current
	light-trap	7m 28f	05Jun-19Aug	at sites 2-6
	sweep	4m 12f	23May-14Aug	
HYDROPTILIDAE				
Agraylea multipunctata Curtis, 1834	light-trap	3f	05Jun	probably from lakes or ponds
Hydroptila consimilis Morton, 1905	light-trap	12m 166f	05Jun-05Aug	
Hydroptila grandiosa Ross, 1938	light-trap*	13f	05Jun-09Jul	
Hydroptila hamata Morton, 1905	light-trap*	4f	09Jul	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
Hydroptila jackmanni Blickle, 1963	light-trap	2m	25Jul	
Hydroptila valhalla Denning, 1947	light-trap	5m	09Jul-22Jul	
Hydroptila virgata Ross, 1938	reared	2m	01Jul	rock riffles, and pools
Hydroptila waubesiana Betten, 1934	light-trap*	23f	05Jun-19Aug	
Hydroptila wyomia Denning, 1947	light-trap*	393f	25Jun-05Aug	
Ochrotrichia spinosa (Ross, 1938)	light-trap	3m 4f	09Jul-22Sep	
Orthotrichia aegerfasciella (Chambers, 1873)	light-trap*	2f	09Jul	probably from lakes or ponds
Oxyethira anabola Blickle, 1966	larvae*	2	04Apr**	rock riffles
	light-trap	5f	05Jun-25Jun	
Stactiobiella palmata (Ross, 1938)	light-trap	1m 11f	05Jun-25Jun	
BRACHYCENTRIDAE				
Micrasema kluane Ross and Morse, 1973	larvae	83	27Aug-05May	large moss-
	reared	41m 38f	27Apr-08Jun	covered rocks
	reared (5 Mo.)	10m 5f	10Dec-18Dec	at site 2
	reared (8 Mo.)	3m 1f	03Apr-23May	
	light-trap	1m 1f	05Jun	
	sweep	29m 17f	23May-12Jun	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
Micrasema rusticum	larvae	70	14Sep-09May	rock riffles at
(Hagen, 1868)	reared	36m 50f	14May-15Jul	site 4
	light-trap	45m 230f	05Jun-22Jul	
	sweep	39m 12f	04Jun-12Jun	
Micrasema wataga	larvae	17	23May-05Jun	boulder riffles
Ross, 1938	light-trap	3m	25Jun	at site 5
HELICOPSYCHIDAE				
Helicopsyche borealis	larvae	170	year-around	rock riffles
(Hagen, 1861)	reared	1m 4f	01Jul-09Jul	at site 4
	reared (5 Mo.)	1m	29Dec	
	light-trap	10m 8f	25Jun-05Aug	
	sweep	2m 1f	12Jun-18Jun	
LEPIDOSTOMATIDAE				
Lepidostoma bryanti	larvae	39	18Jan-09May	leaf packs in
(Banks, 1908)	reared	4m 2f	11May-25Jul	pools at
	reared (8 Mo.)	3m	23Mar-07Apr	sites 2, 3,
	light-trap	29m 245f	05Jun-25Jun	5 & 6
	sweep	3m	25May-12Jun	
Lepidostoma costalis	larvae	12	12Dec-28Jan	stones in
(Banks, 1914)	reared	3m 2f	28Jul-05Aug	moderate current
				at sites 2 & 6
Lepidostoma griseum	larvae	20	28Jan-08Jul	pools at
(Banks, 1911)	pupa	1	24Jul	sites 2, 4 & 6
	reared	1m	20Aug	
Lepidostoma libum	larvae	656	year-around	leaf packs in
Ross, 1941	pupae	111	17Jun-26Aug	spring seep at
	reared	402m 403f	30Apr-08Sep	site 1
	sweep	2m 4f	14Aug-02Sep	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
Lepidostoma sackeni	larvae*	10	20Jan-29Jul	leaf packs in
(Banks, 1936)	reared	2m 10f	30Jul-26Aug	spring seep at
	sweep	2m 1f	14Aug-08Sep	site 1
Lepidostoma vernale	larvae*	18	07Nov-31Mar	leaf packs in
(Banks, 1897)	reared	4m	07Apr-13Apr	seep at site 1
LEPTOCERIDAE				
Ceraclea tarsipunctata	light-trap	29m 42f	25Jun-09Jul	
(Vorhies, 1909)				
Ceraclea transversa	light-trap	21m 21f	09Jul-19Aug	
(Hagen, 1861)				
Leptocerus americanus	light-trap	3f	09Jul	probably not
(Banks, 1899)				from Otter Cr.
Mystacides sepulchralis	larvae	17	14Aug-05Jun	reduced current
(Walker, 1852)	reared	10m 9f	23Jun-27Aug	at sites 2,
	reared (6 Mo.)	1f	06Apr	3 & 5
	light-trap	1f	19Aug	
	sweep	6m 1f	12Jun-16Jul	
Nectopsyche sp.	light-trap	1f	09Jul	probably not
				from Otter Cr.
Nectopsyche pavida	light-trap*	1f	05Aug	probably not
(Hagen, 1861)				from Otter Cr.
Oecetis avara	larvae	123	02Jul-23May	sandy, swift
(Banks, 1895)	reared	3m 2f	09Jun-23Jun	water at
	light-trap	186m 75f	05Jun-22Jul	sites 2 & 4
	sweep	9m 16f	04Jun-13Jul	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
Oecetis cinerascens (Hagen, 1861)	reared	1m	11Sep	pools at site 3
Oecetis inconspicua (Walker, 1852)	light-trap	28m 25f	05Jun-19Aug	probably from nearby ponds
Triaenodes dipsius Ross, 1938	light-trap	1f	02Sep	
Triaenodes tardus Milne, 1934	light-trap	5f	25Jun-19Aug	
LIMNEPHILIDAE				
Anabolia consocia (Walker, 1852)	larvae	12	12Dec-18Jun	pools, margin
	reared	2m 2f	05Jun-07Aug	of creek at
	light-trap	1m 1f	08Sep,25Jun	sites 2, 3 & 5
Frenesia missa (Milne, 1935)	larvae	8	15Jul-30Oct	spring seep at
	pupa	1	03Oct	site 1
	sweep	2m	05Nov,20Jan	
Hesperophylax designatus (Walker, 1852)	larvae	9	24Jan-28Jan	intermittent
	light-trap	1m 2f	05Jun	feeder
Hydatophylax argus (Harris, 1869)	larvae	46	31Aug-02Apr	pools, in leaf
	light-trap	8f	05Jun-25Jun	packs at
	sweep	1f	12Jun	sites 2, 3 & 5
Ironoquia lyrata (Ross, 1938)	larvae	27	23Apr-11Jul	muck areas near banks at
	reared	1m 1f	11Aug	sites 2, 4 + 6
	light-trap	1m	19Aug	
Limnephilus sp.	larvae	3	09Mar-23Apr	pools at site 3

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
Neophylax concinnus McLachlan, 1871	larvae	281	09Mar-28Jan	rock riffles at
	pre-pupae	29	02Jul-31Jul	sites 2, 4 & 6
	pupae	26	12Aug-03Oct	
	reared	2m 4f	10Sep-22Sep	
	sweep	4m 3f	10Sep-03Oct	
Neophylax oligius Ross, 1938	larvae	262	20Jan-11Sep	rock riffles at
	pupae	20	14Aug-27Aug	sites 2, 4 & 6
	reared	30m 22f	08Aug-22Sep	
	light-trap	3m 3f	02Sep	
	sweep	5m 2f	08Sep	
Platycentropus radiatus (Say, 1824)	larvae	80	17Oct-04Jun	pools at site 3
	reared	1m 1f	29Jul,21Jul	
	light-trap	1m 1f	09Jul,05Aug	
Pseudostenophylax spp. Martynov, 1909	larvae	125	07Nov-26Aug	spring seep at site 1
Pseudostenophylax sparsus (Banks, 1908)	reared*	1f	09Jun	spring seep at site 1
Pseudostenophylax uniformis (Betten, 1934)	pupa	1m	01Jul	spring seep at site 1
	reared*	2f	25Jun,16Jul	
Pycnopsyche guttifer (Walker, 1852)	larvae*	745	12Dec-17Oct	pools, reduced current at
	pupae	69	11Aug-27Aug	sites 2-6
	reared	330m 318f	22Aug-14Sep	
	light-trap	69m 38f	02Sep-11Oct	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

Species	*Collections*	*Number*	*Dates*	*Habitat*
Pycnopsyche lepida	larvae*	94	09Dec-22Aug	pools, reduced
(Hagen, 1861)	reared	3m 10f	18Aug-03Sep	current at
	light-trap	27m 51f	19Aug-08Sep	sites 2-5
Pycnopsyche scabripennis	larvae*	411	12Dec-24Jul	pools, reduced
(Rambur, 1842)	pupae	2	31Jul,14Aug	current at
	reared	3m 4f	17Aug-29Aug	sites 2-6
	reared (5 Mo.)	1m 6f	13Apr-27Apr	
	light-trap	21m 10f	05Aug-08Sep	
MOLANNIDAE				
Molanna blenda	larvae	16	14Sep-18May	sand in moderate
Sibley, 1926	reared	3m 6f	11Jun-01Aug	to slow current
	reared (4 Mo.)	1m	23Mar	at sites 2-4
	light-trap	3m	05Jun-09Jul	
	sweep	1m	05Jun	
ODONTOCERIDAE				
Psilotreta indecisa	larvae	144	12Jul-30Apr	sand in
(Walker, 1852)	pupa	1	15Jul	moderate current
	reared	13m 9f	30Mar-13Jun	at sites 2-6
	light-trap	6m 15f	05Jun	
	sweep	5f	12Jun-02Jul	
PHRYGANEIDAE				
Banksiola crotchi	light-trap	1m	09Jul	probably from
Banks, 1943				lakes or ponds
Oligostomis ocelligera	larvae	2	17Oct,12Dec	pools at site 2
(Walker, 1852)				
Ptilostomis ocellifera	larvae*	54	14Sep-06May	pools at site 2
(Walker, 1852)				

*Identification tentative.
**Collected in previous years, but not during study.

species were collected from Otter Creek. Three *Limnephilus* larvae were collected, but could not be identified to species. The 54 *Ptilostomis* larvae were throught to be *P. ocellifera,* but no confirming adults were reared or collected, and the *Oxyethira* larvae were probably *O. anabola,* the only *Oxyethira* species collected as an adult. Larvae of 3 species of *Polycentropus* were collected and tentatively identified as *P. centralis, P. flavus,* and *P. remotus* using the key by Ross (1944), while adults of *P. centralis, P. aureolus,* and *P. pentus* were collected and positively identified. This indicates that *P. centralis* larvae were correctly identified, but suggests that since larvae of *P. aureolus* and *P. pentus* are unknown, they may have been collected and incorrectly identified as *P. flavus* or *P. remotus.* Similarly, *Hydroptila jackmanni* and *H. valhalla* were identified only from males; their females and those of some other species of *Hydroptila* have not been described. Females of *H. jackmanni* and *H. valhalla* may have been collected and incorrectly identified as *H. grandiosa, H. hamata, H. waubesiana,* or *H. wyomia,* four species that were tentatively identified only from collections of females. Several other species that are known to live in streams similar to Otter Creek were collected in significant numbers, but identified only as adults. These include *Cheumatopsyche pettiti, Hydroptila consimilis, Stactobiella palmata, Ceraclea tarsipunctata, C. transversa, Oecetis inconspicua,* and *Phylocentropus placidus,* all of which probably developed in Otter Creek. It therefore appears that a minimum of 56 species of caddisflies live in Otter Creek, and that 10 to 14 more species that were collected only as adults may also develop in the stream.

Although most species of caddisflies were attracted by the black-light, some obviously were not. *Chimarra aterrima, Glossosoma nigrior, Micrasema kluane* and the species of *Lepidostoma* except *L. bryanti,* and both species of *Neophylax* did not appear to be attracted to light. In addition, females of several species were much more attracted to light than males. These include *Cheumatopsyche gracilis, C. oxa, Hydropsyche betteni, Ceratopsyche slossonae, Nyctiophylax moesta, Hydroptila consimilis, H. wyomia, Micrasema rusticum,* and *Lepidostoma bryanti.* We must point out, however, that males of some species of caddisflies fly mostly just before dawn while females fly in the evening (personal communication: David S. White, University of Michigan). Special mention should also be made of the fact that only females of *Psychomyia flavida* were collected, supporting Corbet's contention (1966a) that populations of this species are frequently parthenogenic. In *Oecetis avara,* males were more attracted to light than females.

Most of the species in Otter Creek are apparently univoltine, some with short periods of emergence and others with several cohorts that emerge over a prolonged period. A few species may be bivoltine, and one, *Psilotreta indecisa,* is probably semivoltine.

The fauna of the spring seep (Site 1) is of special interest. Larvae of *Frenesia missa, Pseudostenophylax uniformis* and/or *sparsus, Lepidostoma libum, L. sackeni,* and *L. vernale* were collected only from this seep. Larvae of the other 3 species of *Lepidostoma, L. bryanti, L. costale,* and *L. griseum* were never found in the seep and occurred only in the stream. Ours is only the second North American record for *L. libum,* which was abundant in the spring seep. Its absence from collections since its discovery in Illinois by Ross (1944) probably results from adults not being attracted to light-traps, which are widely used to collect caddisflies.

Two observations related to terrestrial pupae deserve special mention. *Hydatophylax argus* larvae constructed cases of circular leaf pieces in early autumn, and moved to cases they constructed of bulky

wood chunks as winter approached. Larvae with both types of cases were readily collected in the autumn, but were never found in the 2 months prior to their emergence in June. Is it possible that this species has a terrestrial pupa as reported by Flint (1958) for *Ironoquia parvula?* We collected larvae of another species of *Ironoquia, I. lyrata,* and reared them to adults on submerged substrate in an aquarium, showing for the first time that unlike *I. parvula* this species has an aquatic pupa.

Specimens collected in this study are deposited in the University of Wisconsin Insect Collection, except for *Cheumatopsyche pasella,* which is at Florida A & M University, Tallahassee, Florida, and *Ironoquia lyrata,* which is at the Royal Ontario Museum, Toronto, Ontario.

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GRAY PARTRIDGE IN NORTHWESTERN WISCONSIN

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Abstract

Gray partridge (*Perdix perdix*) were first released into St. Croix County in 1923 with the last known release in 1959. The bird is now established in St. Croix and adjacent counties in northwestern Wisconsin at a low but apparently stable population density.

INTRODUCTION

The history of gray or Hungarian partridge in Wisconsin has been reported by Leopold (1940), McCabe and Hawkins (1946), Lemke (1957), Basadny (1965) and Dumke (1977). Briefly, Colonel Gustav Pabst introduced the species into Waukesha County in southeastern Wisconsin from 1908-29 through a series of releases totaling 5,000 birds imported from western Czechoslovakia. These introductions and additional private and Wisconsin Conservation Department releases were responsible for the successful establishment and spread of the partridge throughout the southeastern third of the state (Fig. 1).

An isolated population of gray partridge has existed in northwestern Wisconsin for more than 50 years. The earliest release of partridge in this area was in 1923, when 20 partridge were released near Hudson in St. Croix County by Andrew Hope (Leopold 1940). During the period 1925-31, about 300 partridge reared by Joseph Burkhart from eggs bought in Alberta, were released in Polk County by the Rock Creek Trout Club (Leopold 1940). Colonel Pabst was involved in the planning of this effort. In 1930, 20 partridge imported from Europe and 30 birds produced at the State Game Farm were released in St. Croix County by the Wisconsin Conservation Department (Leopold 1940). Leopold stated that 2 coveys were seen in St. Croix and adjacent Pierce Counties in 1932 and 1934, but no partridge existed in the area in 1937. Other early releases in northwestern Wisconsin were in Eau Claire County in 1934 and Dunn County in 1941 (Lemke 1957).

A 1943 survey by McCabe and Hawkins (1946) revealed the existence of small, isolated populations of gray partridge in Polk, St. Croix and Buffalo Counties. However, these populations were not delineated on the range map drawn for Wisconsin in their publication. Leopold (1940) and McCabe and Hawkins (1946) were not sure of the origin of the birds and thought they originated from either the early releases or eastward drift of Minnesota populations.

Lemke (1957) reported additional releases of gray partridge in Barron and Buffalo Counties in 1951. In 1957, 254 partridge hatched and raised at the Poynette State Game Farm were released in St. Croix County (L. E. Hanson pers. commun.). Another 80 birds were released in adjacent Dunn County. The last known stocking effort occurred in 1959 when 40 birds from the State Game Farm were released in St. Croix County, about 3 miles south of Baldwin (E. P. Ruetz pers. commun.).

In the mid-1960s, Besadny (1965) reported that small numbers of gray partridge still existed in Polk, St. Croix and Buffalo Counties although little was known about the populations. A decade later, Faanes and Goddard (1976) stated that the gray partridge was a rare resident of St. Croix and

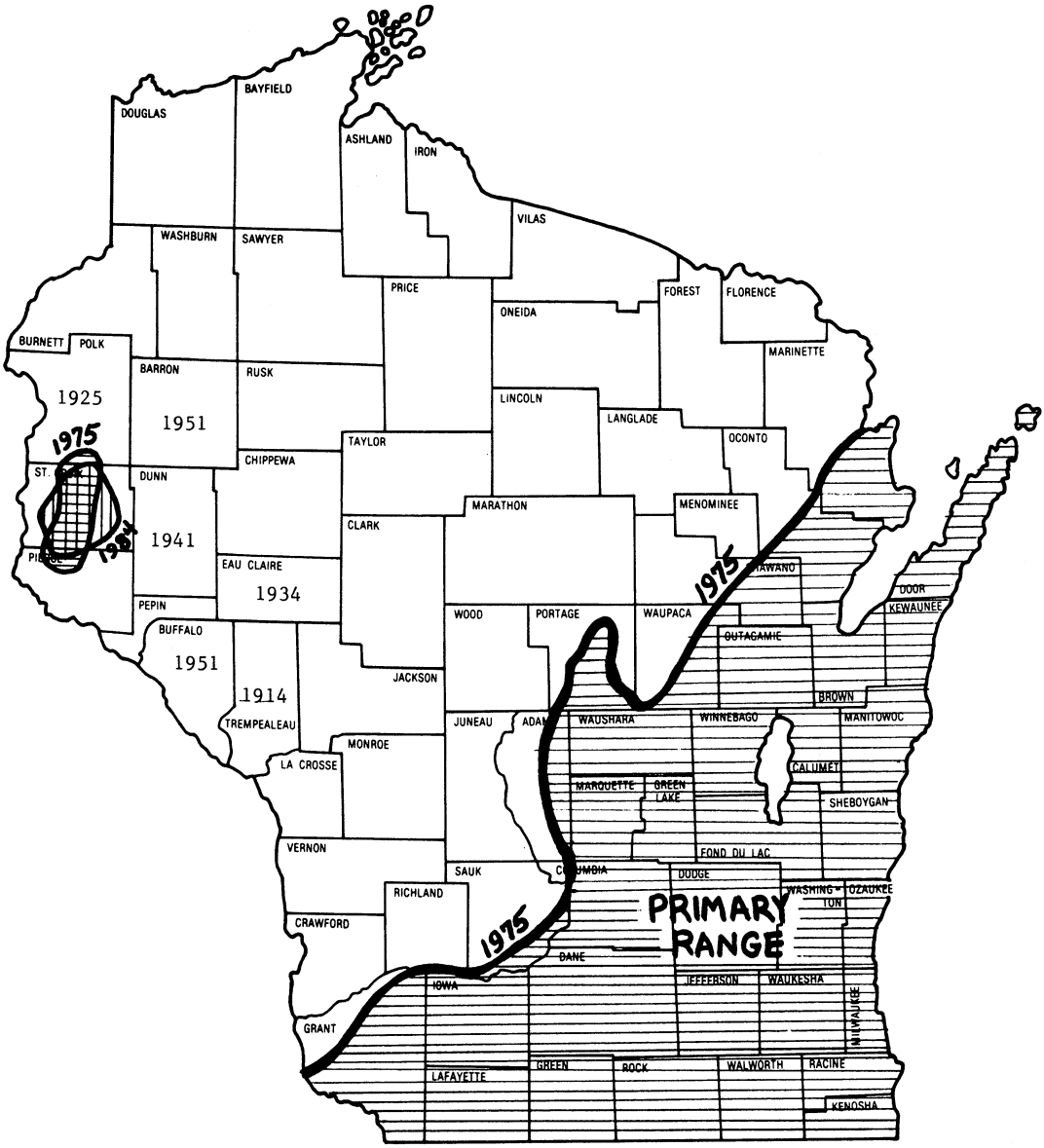

FIGURE 1. Range of gray partridge in Wisconsin (Dumke 1977). Year of first known introductions given for Polk, Barron, Dunn, Eau Claire, Buffalo, and Trempealeau Counties.

Pierce Counties with small coveys occasionally observed northwest of Hammond in St. Croix County. Dumke (1977) also reported the continued existence of the St. Croix and adjacent Pierce County population and its range was delineated on a state map for the first time. The most recent published report was by Faanes (1981) of a small population largely restricted to several townships in central St. Croix County near Roberts.

Status and Range

A search of the Wisconsin Society for Ornithology files produced records only for St. Croix and Pierce Counties and not for Polk, Barron, Dunn or Eau Claire Counties (R. K. Anderson pers. commun.). Kemper (1973) stated that the gray partridge was extremely rare in Eau Claire County with the only record being a covey he saw during the winter of 1962 near Fairchild.

Wisconsin Department of Natural Resources (WDNR) Wildlife Managers J. L. Porter, J. A. Cole and R. K. Bahr working in Barron and Dunn Counties could provide only two records. One observation, made just north of Menonomie in Dunn County by R. K. Bahr, lacked written documentation and the second, reported by J. L. Porter, was a group of 2-3 birds seen near Chetek, Barron County by WDNR Conservation Warden O. A. Anderson sometime during the period 1975-77. A second record for Barron County was a single bird seen near Prairie Farm during the fall of the same period of 1975-77 (J. Pederstuen pers. commun.). These scattered records suggest an extremely low population or juvenile birds dispersing in the fall from the established range in adjacent St. Croix County.

WDNR personnel working in southern Polk, St. Croix and Pierce Counties in 1980-84 recorded observations of gray partridge made incidental to other work. The range delineated by these observations falls within the 1975 limits drawn by Dumke (1977) (Fig. 1).

Table 1. Gray partridge coveys seen per 100 miles by rural mail carriers.[a]

Year	*Poor Range*[b]	*Good Range*[c]
1974	0.4	3.9
1975	0.4	4.1
1976	0.3	9.6
1977	0.3	2.7
1978	0.3	6.1
1979	0.6	11.1
1980	0.4	2.1
1981	0.3	6.1
1982	0.9	10.1
1983	0.4	1.4
Mean	0.4	5.7

[a] DNR Technical Services Section

[b] St. Croix, Polk, Pierce, Barron and Dunn Counties (Dumke 1977).

[c] Manitowac, Calumet, Brown, Kewaunee and Outagamie Counties (Dumke 1977).

During the winters of 1982-83 and 1983-84, gray partridge seen incidental to conducting road transects to census ring-necked pheasants (*Phasianus colchicus*) in a portion of St. Croix County were also recorded. Results of 0.3 and 0.1 coveys seen per 100 miles of road transect were within the density range classified as "poor" by Dumke (1977) and compares to the densities recorded by rural mail carriers in January for northwestern Wisconsin (Table 1). The mail carrier observations in some counties might not be reliable due to ruffed grouse (*Bonasa umbellus*), colloquially known as "partridge," being confused with gray partridge.

The gray partridge has been a member of the wildlife community in the farmlands of St. Croix and adjacent Pierce Counties for more than 50 years. The bird should continue to exist in this region, albeit at a low population density, if present agricultural practices do not intensify dramatically in the future.

I acknowledge the efforts of B. A. Moss, former WDNR Wildlife Manager at Bald-

win, for providing the 1980-82 gray partridge observation locations, A. J. Rusch, WDNR Technical Service Section, for the use of unpublished rural mail carrier survey data, and R. A. Hunt and R. T. Dumke, WDNR Bureau of Research, for critical review of the manuscript.

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CHARACTERISTICS OF RUFFED GROUSE DRUMMING SITES IN NORTHEASTERN WISCONSIN

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Abstract

The vegetative characteristics around ruffed grouse *(Bonasa umbellus)* drumming sites were sampled and compared among five different cover types. Forty-two drumming logs were located on the Navarino Wildlife Area in northeastern Wisconsin, and the density, height and species of shrubs, saplings and trees around each were recorded by the point-centered quarter method. Vegetation measurements around drumming logs were compared to 40 random points within each cover type. Highest densities of drummers were found in alder *(Alnus rugosa)* and aspen *(Populus tremuloides* and *P. grandidentata).* High shrub density, regardless of species, was the most crucial factor involved in distribution of drumming sites within each cover type. Drumming site characteristics and drummer densities throughout the range of the ruffed grouse were compared to our findings in northeastern Wisconsin.

INTRODUCTION

The densest populations of ruffed grouse reported in the literature are usually associated with aspen forests (Dorney 1959, Gullion 1970, Rusch and Keith 1971, Rusch et al. 1978). Within this forest type, males usually select a drumming site with a dense shrub layer (Boag and Sumanik 1969, Boag 1976, Kubisiak et al. 1980). However, ruffed grouse also live in a variety of habitats where aspen is scarce or absent (Marshall 1946, Hardy 1950, Lewis et al. 1968, Hein 1970, Porath and Vohs 1972, Hale et al. 1982) and drumming site selection and drummer densities in these habitats are less well documented. In Wisconsin, drumming male grouse are also found in oak (*Quercus* spp.), mixed northern hardwoods, and alder cover types (Dorney 1959, Kubisiak et al. 1980, Rodgers 1980). We compared drumming site characteristics and drumming male densities among these various cover types in Wisconsin and with other habitats in the ruffed grouse range.

The Navarino Wildlife Area (NWA) in Shawano and Waupaca Counties, Wisconsin, encompasses a variety of vegetative communities. Our objectives were (1) to determine which forest types were used by drumming male grouse; (2) to determine the drumming male densities in each forest type; (3) to describe the vegetative characteristics around drumming logs in each of these forest types; and (4) to compare these characteristics and densities with other published studies. We used presence and densities of drumming males and characteristics of

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drumming sites to make inferences about factors which may have been involved in habitat selection.

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Study Area and Methods

The 6,500-ha NWA is owned by the Wisconsin Department of Natural Resources (WDNR) and is managed primarily for forest wildlife. About 55% (3,600 ha) of NWA is forested with 1,800 ha of aspen, 1,400 ha of hardwoods, and 400 ha of conifers. The predominate hardwoods are red maple (*Acer rubrum*), oaks, and white birch (*Betula papyrifera*), and the major conifers are white and red pine (*Pinus strobus* and *P. resinosa*) and tamarack (*Larix laricina*). In addition, there are 800 ha of brush, predominantly speckled alder and willow (*Salix* spp.; WDNR, unpubl. rep., NWA master plan concept elements, Madison, Wis., 1978). Topography is flat except for several high (10–15 m) sandy ridges separated by marshes of sedge (*Carex* spp.).

From late March to late May 1980 and 1981 we searched for drumming logs by following the drumming sound and locating piles of grouse droppings. Vegetation at 42 of the logs located in 1980 was sampled by the point-centered quarter method (Cottam and Curtis 1956). The drumming stage served as the center point and the distances to the nearest shrub (single- or multi-stemmed woody growth between 1–2 m tall), sapling (stems < 10 cm dbh), and tree in each quarter were measured. The heights of shrubs and saplings, the basal areas of trees and the species of each plant were recorded. Densities of shrubs, saplings, and trees were calculated from distance data (Cottam and Curtis 1956). Herbaceous ground cover was not measured because it was not present at the initiation of the drumming season and probably did not influence selection of drumming sites.

We recognized five forest types within potential ruffed grouse habitat on NWA: (1) mature oak and aspen with witch-hazel (*Hamamelis virginiana*) dominant in the understory, (2) mature hardwoods, predominately red maple and white birch, and aspen with variable understory growth, (3) young (10–15 years) upland aspen with cherry (*Prunus* spp.), blackberry (*Rubus* spp.), hazelnut (*Corylus americana*), and white birch shrub layer, (4) young (10–15 years) offsite (wet lowland) aspen with dogwood (*Cornus* spp.) shrubs predominating, and (5) alder thickets. Estimates of densities of drumming males in each forest type were calculated from numbers of activity centers (Gullion 1967) located within a sample plot of known size. Some drummers were captured in mirror traps (Tanner and Bowers 1948) and marked with numbered leg bands to facilitate identification of primary and alternate logs and activity centers (Gullion 1967).

Within each forest type we sampled vegetation at 40 randomly selected points, using the same sampling procedure as at the drumming logs. We then compared the vegetation at random points with the vegetation on drumming sites in each of the five forest types. When plants are aggregated, density estimates computed from point samples by usual methods tend to be low (Cottam and Curtis 1956); thus we used the modified

TABLE 1. Density estimates of drumming male ruffed grouse in 5 forest types, calculated from a sample plot of known size on the Navarino Wildlife Area (NWA), Wisconsin, 1980 and 1981.

	Area (ha)		No. drummers on sample plot		Drummers/100ha	
Forest Type	NWA[a]	Sample plot	1980	1981	1980	1981
Mature oak-aspen	150	65	2	2	3.1	3.1
Mature hardwoods-aspen	600	39	1	1	2.6	2.6
Young upland aspen[b]	900	103	9	5	8.7	4.8
Young offsite aspen[b]	900	119	7	6	5.9	5.0
Alder thicket	550	90	6	6	6.7	6.7
Totals	3100	416	25	20		

[a] Approximate total ha of each forest type on NWA.
[b] Aspen of approximately 10-15 years of age.

TABLE 2. Comparison of ruffed grouse drumming male densities with forest types and understory densities on several areas of the ruffed grouse range. Alder and aspen habitats appear to support the highest male densities, but when not available other forest types may support relatively high densities (e.g., young hardwood stands with shrub understory in Iowa, balsam fir in northern Wisconsin). Thick understory cover generally supports high male densities, but dense shrubs and saplings devoid of overstory apparently do not support drumming males (e.g., early successional aspen in Minnesota, northeastern Wisconsin and Alberta).

Area of Study	Forest type	Understory[a]	Drumming males per 100 ha[b]	Reference
Northeastern Wisconsin	Early successional aspen[c]	16,582 stems/ha	0	DeStefano and Rusch (this study)
	Alder	15,645 stems/ha	6.7[d]	
	Young upland aspen	12,553 stems/ha	6.7	
	Young offsite aspen	32,810 stems/ha	5.4	
	Mature oak-aspen	914 stems/ha	3.1	
	Mature hardwoods-aspen	2,305 stems/ha	2.6	
Minnesota	Early successional aspen[c]	29,652 aspen stems/ha	0	Gullion 1970
	Mature aspen with hardwood shrubs	14,826 aspen stems/ha	48.6	
	Mature aspen with hardwood shrubs and saplings	7,413 aspen stems/ha	48.6	
	Mature aspen with hardwood saplings	2,471 aspen Stems/ha	12.3	
	Mature hardwoods and mature aspen	494 aspen stems/ha	5.0	
	Mature hardwoods; aspen	0 aspen stem/ha	0-2	
Alberta	Early successional aspen[c]	2,822 stems/ha	0	Rusch and Keith 1971
	Aspen	4,542 stems/ha	46.3	
	Spruce woods	2,624 stems/ha	4.7	Rusch et al. 1971
Georgia	Oak-hickory with ericaceous shrubs	10,550 stems/ha	1.2	Hale et al. 1982

[a] Usually includes shrub and sapling growth except where noted.
[b] Drumming male densities extrapolated to males/100 ha from original data.
[c] No canopy or forest cover *per se* existed at the early successional aspen stage.
[d] Drumming male densities averaged between 1980 and 1981 (see Table 1).

method of calculation described by Rusch and Keith (1971) to estimate plant densities.

Results and Discussion

In 1980 and 1981, 73 and 85 activity centers, respectively, were located on NWA, 46 of which were used both years by the same or a different bird. In both years, drumming male ruffed grouse were found in all five forest types. Highest densities of drummers were consistently found in alder thickets and young upland and offsite aspen (Table 1). These habitats provided shrub and sapling cover $\geq$ 3 times denser than that in mature oak-aspen or mature hardwoods-aspen. In the latter habitats, only two and three activity centers, respectively, were located on all of NWA. Alder and aspen also supported high grouse densities throughout much of the central portion of the ruffed grouse range (Table 2).

Within alder and upland aspen habitats, male ruffed grouse selected drumming sites with denser shrubs than were found at random points ($P < 0.05$). In young offsite aspen, shrubs were uniformly dense at drumming logs and random points. The three logs in hardwoods-aspen were also located in shrub growth unusually dense for that type. Shrubs were uniformly scarce in the oak-aspen forest, and shrub densities at the two drumming logs were similar to those at random points. However, these logs were found in areas of unusually dense sapling growth. In this forest community with sparse understory, saplings may have provided the necessary understory cover near drumming logs. In all other cover types, sapling densities at random points and drumming logs were similar (Table 2).

Shrub and sapling heights, tree basal area, and tree density were generally not different for random points and drumming logs in each of the 5 cover types, indicating that these characteristics probably did not influence drumming site selection on NWA ($P > 0.2$). However, there were 3 exceptions: (1) sapling heights were greater around random points than around drumming logs in mature oak-aspen ($P < 0.05$), (2) average tree basal area was significantly larger around drumming logs in alder than at random points ($P < 0.05$). and (3) tree density was significantly greater around drumming logs than at random points in young offsite aspen ($P < 0.01$). Shorter saplings indicate younger, and therefore denser, growth in the oak-aspen type where saplings were more important as cover than shrubs. As the saplings got older, natural thinning reduced the amount of vertical cover. The latter two differences might be related to active selection for drumming sites with some overstory in young forests and brushy habitats, or they may be incidental consequences of sites near habitat edges.

Gullion et al. (1962), Berner and Gysel (1969), and Kubisiak et al. (1980) suggested that drumming logs are often located on or near habitat edges. All of the logs in alder located by Kubisiak et al. (1980) in central Wisconsin were within 40 m of a cover type edge, and 91% were within 20 m. On NWA, timber cutting and topography often created sharp lines of demarcation between habitat types, such as aspen-field edges and lowland alder-upland aspen. Of the drumming logs we found, 91% were within 40 m of an edge, and 58% were within 20 m. In addition, drumming logs in young upland aspen had significantly fewer aspen saplings around them than did random points, and significantly more hazelnut shrubs and white birch saplings ($P < 0.05$). Drumming logs in alder thickets had significantly fewer alder shrubs and saplings and significantly more aspen saplings than did random points in alder ($P < 0.05$). This intermixing of species and the proximity of drumming logs to adjacent cover types would seem to indicate that grouse on NWA selected drumming sites near habitat edges. However, drumming log locations were not significantly closer to edges than were randomly located points ($P > 0.5$). Most coverts on NWA were in small, highly interspersed patches, and most drum-

ming sites were consequently near an edge. Drumming site selection thus seemed more dependent upon shrub cover than proximity of edge *per se*.

Four species of shrubs made up 55% of the shrub cover around drumming logs on NWA (Table 3). Dogwoods and winterberry (*Ilex verticillata*) were found more frequently around drumming logs than at random points, and witch-hazel and cherry shrubs less frequently (Table 3). Dogwood and winterberry shrubs were significantly nearer sampling points than were witch-hazel and cherry shrubs ($\bar{x} = 1.2 \pm 1.6$ m vs. 4.3 ± 3.4 m, respectively, $t = 8.87$, $P < 0.01$), even though the former were less abundant than the latter (Table 3). This may indicate that dogwood and winterberry shrubs grew in denser clumps and provided better cover. In alder thickets, hazelnut and slippery elm (*Ulmus rubra*) formed the shrub layer more often around drumming logs than at random points ($P < 0.01$), and their proximity to sampling points (0.6 ± 0.2 m and 0.6 ± 0.5 m, respectively) indicated that these species also may have grown in dense clumps.

Four sapling species made up 71% of the sapling cover around drumming logs (Table 3). Cherry and white birch were found more frequently around drumming logs than at random points, and aspen saplings less so (Table 3). However, mean distance of cherry and white birch from sampling points was significantly greater than aspen (4.9 ± 5.1 m vs. 2.7 ± 4.2 m, respectively, $t = 3.40$, $P < 0.01$). Optimal sapling growth on drumming sites may be dense enough to provide protection from avian predators, yet open enough to allow detection of mammalian predators (Gullion 1970). In contrast, Boag and Sumanik (1969) suggested that cover selected by drumming males may represent an evolutionary compromise between cover dense enough for full protection against predators and sparse enough to allow exposure of the visual and auditory displays to conspecifics. Available data on ruffed grouse habitats and densities in North America supported the idea that abundance of grouse was generally related to the density of the forest understory (Table 2). Considering the potential bias and variance in estimates of grouse density, the relationship was surprisingly consistent. Early successional aspen without forest overstory did not support ruffed grouse in Minnesota, Alberta, or northeastern Wisconsin (Table 2). We have witnessed, but not documented, a similar instance in Manitoba. We conclude that understory stem density alone does not govern site selection by drumming male ruffed grouse. Forest overstory also seems to be required, perhaps for protection from avian predation as suggested by Gullion (1970). Although forest understories which are too dense for adequate detection of mammalian predators or too dense for satisfactory auditory and visual communication among ruffed grouse may exist in

TABLE 3. Percent frequency of shrub and sapling species around 42 drumming logs and 200 random points in 5 forest types used by ruffed grouse on the Navarino Wildlife Area, Wisconsin. Four shrubs and 4 saplings per point or log were recorded by the point-centered quarter method.

Species[a]	Random points	Drumming logs
Witch-hazel	16	4[c]
Speckled alder	16	16
Cherries	11	4[c]
Dogwoods	10	15[b]
Blackberry	9	11
Winterberry	5	13[c]
Other shrubs	33	37
Total shrubs	100	100
Aspen	42	24[c]
Speckled alder	17	17
Red maple	14	14
Oaks	9	6
White birch	5	9[b]
Cherries	3	16[c]
Other saplings	10	14
Total saplings	100	100

[a] Scientific names given in text.

[b,c] Significantly different ($P < 0.05$, < 0.01, respectively) frequencies at drumming logs than at random points.

North America, as implied by hypotheses of Gullion (1970) and Boag and Sumanik (1969), we have not found this documented in the literature.

Dense shrub-like growth, regardless of species, is probably the most crucial factor involved in drumming site selection in any forest type. Alder and aspen cover types appear to support the highest densities of drumming male grouse, but when not available other forest types may provide suitable cover, such as young hardwood stands with shrub understory in Iowa (Porath and Vohs 1972) and balsam fir in northern Wisconsin (Kubisiak et al. 1980). Thick understory cover generally supports high male densities, but dense shrubs and saplings devoid of overstory apparently do not (Rusch and Keith 1971).

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BROOK LAMPREYS (*ICHTHYOMYZON FOSSOR* AND *LAMPETRA APPENDIX*) IN THE WISCONSIN PORTION OF THE ILLINOIS RIVER DRAINAGE

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The distribution of Wisconsin fishes has been recently detailed by Becker (1983), with additional work conducted by the Wisconsin Department of Natural Resources Fish Distribution Survey (Fago 1982, 1983). The purpose of this note is to provide new locality information for two species of nonparasitic brook lampreys in southeast Wisconsin. Both species were collected on April 25, 1982, in the Mukwanago River, a tributary to the Fox River in the upper Illinois River drainage.

Northern Brook Lamprey

Two adult northern brook lampreys (*Ichthyomyzon fossor*) were captured with a seine at the County Road E crossing, just downstream from Eagle Spring Lake in Waukesha County (T-5-N, R-17-E, Sec. 36). The stream at this site was 3-5 meters wide and less than 1.5 meters deep throughout, with many shallower riffles. The bottom was variable with some gravel, boulders, and silt. Fantail darters (*Etheostoma flabellare*), banded darters (*E. zonale*), a common shiner (*Notropis cornutus*), and a hornyhead chub (*Nocomis biguttatus*) also were collected. Total lengths of the two lampreys after preservation were 131 and 132 mm. Both specimens were deposited in the fish collection of the University of Wisconsin Zoology Museum (UWZM #8266).

Northern brook lampreys have not been reported previously from the Illinois River drainage in Wisconsin (Becker 1983), although they were collected recently at one location in the adjacent Rock River drainage (Fago 1982). They also have been collected recently in the Kankakee River in the upper Illinois River drainage in Illinois, the only known locality for that state (Smith 1979). The upper Illinois River drainage may have been reached by direct dispersal up the Illinois River from the Mississippi River, since locality records in the lower Missouri River drainage (Rohde and Lanteigne-Courchene 1980) indicate that northern brook lampreys were present at one time near the mouth of the Illinois. Alternately, northern brook lampreys may have gained access to the upper Illinois River drainage through recent secondary connections, as postulated by Bailey (1954) for the brassy minnow (*Hybognathus hankinsoni*).

American Brook Lamprey

American brook lampreys (*Lampetra appendix*) were collected at the County Road CP crossing in Waukesha County (T-5-N, R-18-E, Sec. 32). Several spawning aggregations of 8-10 individuals were observed in the early afternoon at a water temperature of 15.4 C and a depth of 26-40 cm. Bottom substrate was gravel and pebbles, and stream width was 8-10 meters. Other fish species collected were hornyhead chubs, blacknose shiners (*Notropis heterolepis*), fantail darters, banded darters, johnny darters (*Etheostoma nigrum*), and rock bass (*Ambloplites rupestris*). Three lampreys were deposited in the University of Wisconsin Zoology Museum (UWZM #8368).

American brook lampreys were not reported from the Wisconsin portion of the Illinois River drainage by Becker (1983), but they recently have been collected in this drainage by the Wisconsin Department of Natural Resources (D. Fago, personal

communication). They also have been recorded in the Fox River drainage in Illinois and elsewhere in the Illinois River system (Smith 1979), and like the northern brook lamprey, have been recorded recently in the adjacent Rock River drainage in Wisconsin (Fago 1982).

Discussion

Brook lampreys may be difficult to detect, even in heavily collected areas (e.g., see Trautman 1981, p. 149). For example, the southern brook lamprey (*Ichthyomyzon gagei*) only recently was discovered in the St. Croix River drainage in northwest Wisconsin (Cochran 1984). That *I. fossor* and *L. appendix* have not been recorded previously from the vicinity of the most densely populated area of Wisconsin is therefore not surprising. It is noteworthy, however, that both species have persisted in this region; populations of brook lampreys have declined near some urban areas (Eddy and Underhill 1974; Trautman 1981). Judging from recent collection records, the American brook lamprey is more commmon than the northern brook lamprey in southeastern Wisconsin.

Brook lampreys often are perceived negatively by the general public, perhaps through association with the sea lamprey (*Petromyzon marinus*) and other parasitic species. Unfortunately, misinformation in certain recent popular Wisconsin publications[1] may serve to perpetuate this tendency. Vladykov (1973) provided ecological, economic, and ethical reasons for the conservation of this relatively vulnerable component of our ichthyofauna.

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Note

[1] Smith (1977) found a "brook lamprey" in the Kickapoo River and stated that ". . . it attaches itself to living fishes and rasps their flesh. It also eats worms and insects." Brook lampreys are not parasitic and no lamprey is known to prey on invertebrates. Also, in a recent newspaper review of Becker's (1983) monograph, Elsner (1983) referred to "detested lampreys." Half of Wisconsin's lamprey species are nonparasitic and do not deserve such a reputation.

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LONG TERM COMPARISON OF THE POPULATION STRUCTURE OF THE CISCO (*COREGONUS ARTEDII* LE SUEUR) IN SMALLER LAKES

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Abstract

Comparisons of the population structure of essentially non-exploited cisco populations in three Wisconsin lakes in 1981–82 with data from 1928–32 revealed that growth has increased significantly in all three lakes and that density appears to have declined since the 1930's. The magnitude of the increase in growth in two of the lakes was comparable to the largest reported differences in growth among years within exploited cisco populations. This change in population structure is consistent with an explanation based on increased predation pressure from introduced piscivores, primarily walleye and muskellunge. Other possible contributing factors are discussed.

Year class strength was variable and asynchronous among lakes both in the 1930's and in the 1980's. This persistent asynchrony among lakes supports Hile's (1936) suggestion that variable year class strength of cisco depends primarily on local conditions within each lake; intraspecific competition may be a major factor.

INTRODUCTION

After Van Oosten's (1929) pioneering work on the age and growth of the cisco or lake herring, *Coregonus artedii,* there was a proliferation of studies describing age and growth of this species in different lakes (Bajkov 1930, Hile 1936, Fry 1937, Carlander 1937 and 1945, Cooper 1937, Smith 1956, Dryer and Beil 1964, Smith 1972 and others (see review by Carlander, 1969). These studies have shown the cisco to be a variable species with large differences in growth rates and condition factors among populations. Investigations dealing with changes within one population over time are not as numerous and the majority of such studies involve exploited cisco populations from the Laurentian Great Lakes (Scott 1951, Smith 1956, Dryer and Beil 1964, Selgeby 1982). Few long term studies have been made on populations in smaller lakes (but see Carlander 1945, Clady 1967, and Hoff and Serns 1983).

The Wisconsin Geological and Natural History Survey's investigations in northern Wisconsin during the 1920's and 1930's included a thorough study by Hile and coworkers on the cisco populations in four lakes and shorter notes on the populations in three other lakes (Hile 1936, Couey 1935, Hile and Juday 1941). These studies provided an opportunity to investigate long term changes in the structure of cisco populations in smaller lakes. Five lakes, including three of Hile's primary lakes, were re-investigated in 1981 and 1982 as part of the Long Term Ecological Research—Northern Lakes project. Of these populations, only the one in Pallette Lake had been studied since the 1940's (Engel and Magnuson 1976, Engel 1976, Hoff and Serns 1983). The populations in Big Muskellunge and Sparkling Lakes are especially interesting, since these populations are currently not exploited and historically have been exploited only to a limited extent if at all. Information on long term changes of unexploited populations is nonexistent.

In the 1930's, the year class strength of cisco was variable but not synchronized

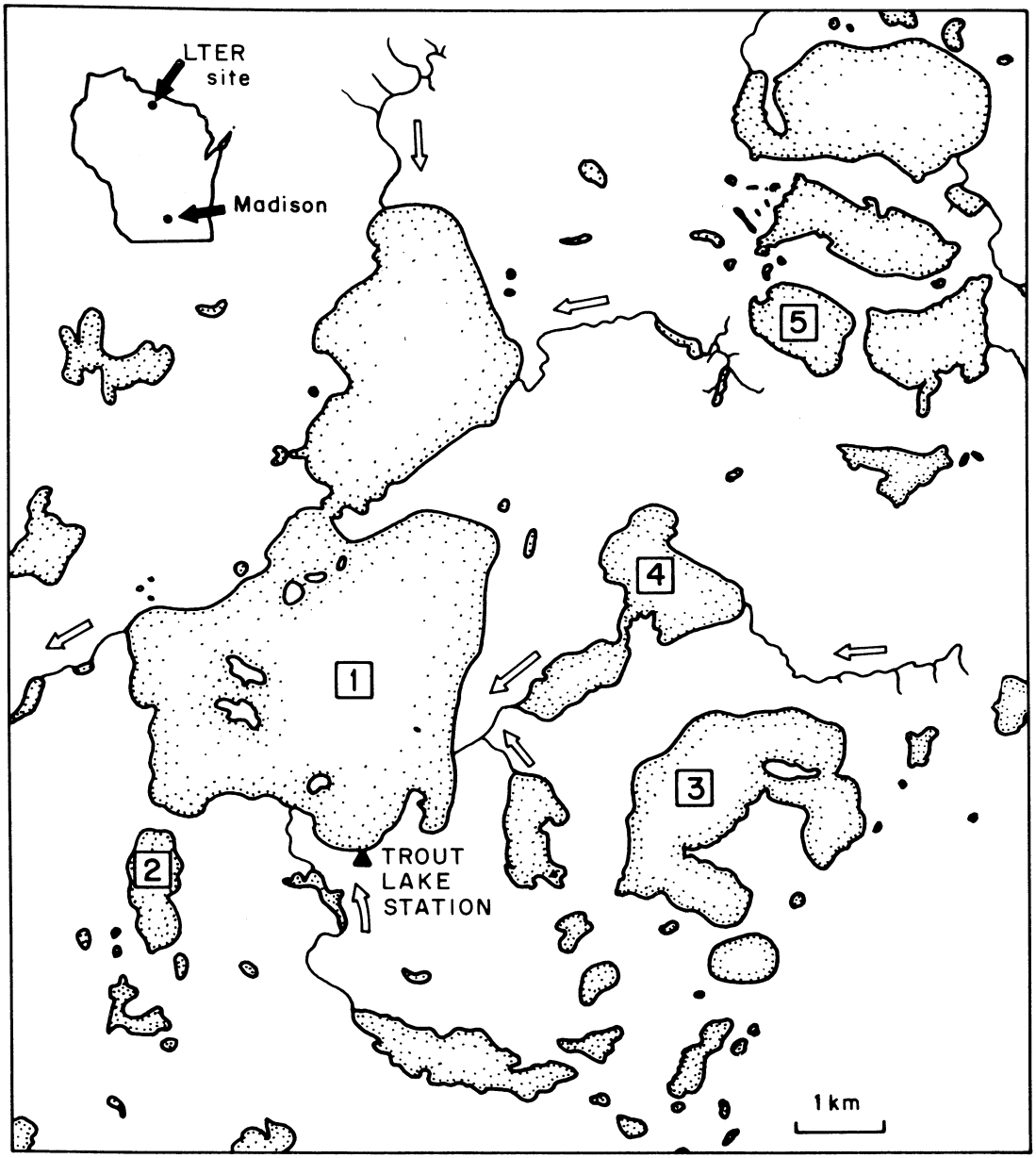

Fig. 1. Map of the study area in Wisconsin's Northern Highland Lake District. The lakes investigated by Hile in the 1930's and re-investigated in 1981–82 were: (1) Trout Lake, (2) Sparkling Lake, (3) Big Muskellunge Lake, (4) Allequash Lake, and (5) Pallette Lake. Note that all the lakes are within eight km of the Trout Lake Station of the University of Wisconsin. The other two lakes investigated by Hile, Clear Lake and Tomahawk Lake, are situated approximately 22 km south of the Trout Lake Station.

among lakes (Hile 1936). Hile, therefore, suggested that year class success depends more on the local conditions within a lake than on weather. Correlations of weather events with year class success have, however, been at least partly successful for other coregonids (Lawler 1965, Christie 1963—temperature; Järvi 1942a, Järvi 1947, Miller 1952—wind); although some investigators have failed to obtain such correlations (Svärdson 1956, Aass 1972). Detailed investigations of the year class structure of cisco populations in lakes in close vicinity to each other are rare. Weather events should affect such lakes in similar ways, although different lake morphometries may modify the effect of storms or air temperature. A persistent asynchrony among strong year classes in these lakes would be consistent with Hile's suggestion and would not support a hypothesis directly relating cisco year class strength to storm events or temperature.

Study Area

The five lakes investigated are located in Vilas Co., in Wisconsin's northern highland lake district. They are surrounded by conifer and aspen-birch forests and all are within eight km of the Trout Lake Station of the University of Wisconsin—Madison (Figure 1). The geology and general topography of the area is described by Juday and Birge (1930). Morphometric and limnological characteristics of the lakes are summarized in Table 1.

Current exploitation of cisco in the lakes investigated is limited or nonexistent. Ice fishing and some seining at spawning time, which includes cisco as an incidental catch, occurs on Trout Lake only. Historically, the Pallette Lake population and to a limited extent the Big Muskellunge and Trout Lake populations have been exploited by seining at the spawning grounds (Serns, DNR-Woodruff, pers. comm., Hoff and Serns 1983).

Methods

Fish sampling

The five lakes were sampled between July 13 and August 18, 1981, and between July 27 and August 19, 1982, with seven vertical gill nets, each with a different mesh size (19mm, 32mm, 38mm, 51mm, 64mm, and 89mm stretch mesh in both years, with a 127mm net in 1981 and a 25mm net in 1982). The nets, 4 m wide and 18 m deep, were made of multifilament nylon twine and mounted on foam rollers following the description by Kohler et al. (1979). The seven nets were set in a straight line for 48 hours per lake along the

Table 1. Morphometric and limnological characteristics of the lakes investigated. All lakes are located in Wisconsin's northern highland lake district.

Lake	Water source (5)	Area (ha)	Max depth (m)	Mean depth (m)	Alkalinity 1979–81 (mmol/l)	Conductivity 1928–42 (μs/cm at 20C)	Conductivity 1979–81 (μs/cm at 20C)	P	pH
Pallette	S	69	19.8	9.7	0.15	21	20	N.S.	7.3
Sparkling	S	81	20.0	11.3	0.61	68	74	<.05	7.9
Big Musk.	S	396	21.4	7.0	0.39	45	48	N.S.	8.2
Trout	D	1605	35.7	13.8	0.82	83	90	<.05	8.3
Allequash	D	164	8.0	2.9	0.79	76	81	—	7.9
Source*	1	1,3	1,3	2,3	4	4	4	4	3,4

* 1) Black *et al.* (1963)
2) Juday and Birge (1941)
3) LTER—Northern Lakes (1981 and 1982)
4) Bowser *et al.* (1982), P = significance level of conductivity changes (two-tailed t-test)
5) S = seepage lake, D = drainage lake.

18 m depth contour (14 m depth contour in Pallette Lake and in the deepest part of Allequash Lake). In 1981, Trout Lake was fished for an additional 24 hours with the nets suspended from 13 to 30 m depth, after a large number of fish targets were observed on sonar in water deeper than 18 m in that lake. In 1982 the nets were elongated to allow fishing in Trout Lake from the surface to 30 m depth. The nets were checked approximately every six hours, between 0300–0500, 0900–1100, 1500–1700, and 2100–2300 central standard time in 1981 and once every 24 hours in 1982. Pallette Lake was sampled only in 1981.

All fish caught were identified, total length measured to the nearest mm and depth of catch noted in one meter intervals. Scales and otoliths were collected from up to ten ciscoes of each 10 mm length group. Scales were collected from above the lateral line between the dorsal and adipose fin in 1981 and above the lateral line between the dorsal and pectoral fin in 1982.

Aging

Scales were used for aging to be consistent with historical data. Impressions of larger scales were made on acetate slides. Smaller scales were mounted on microscope slides. The scales or their impressions were read on a microfiche reader (25x magnification). The age determined for the sample of ten fish from each 10 mm size class was assigned to the remainder of the fish of that size. Overlap in sizes of different year classes occurred

TABLE 2. Comparison between ages assigned from scales and from otoliths for cisco from five Wisconsin lakes sampled in 1981. Encircled numbers indicate correspondence between the two aging methods.

		Otolith Age									
Lake	*Scale Age*	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Older*	*Total #*
Pallette	1			1	1	3	1				6
	2			(1)	4	5	3				13
	3					1					1
Big Musk	0	(3)									3
	1		(11)	2							13
	2			(3)							3
	3				(1)						1
Sparkling	0	(4)									4
	1		(20)	1							21
	2			(3)							3
	7							1			1
Trout	0	(2)									2
	1		(5)	1							6
	2		1	(1)							2
	3						1	1			2
	4				1	(1)			1		3
	5								1		1
	6								3		3
	7								(1)	1	2

only in Trout Lake. The relative numbers of the different size groups were corrected for gill net size selectivity by taking both the selectivity of different mesh size and size dependent changes in locomotory activity into account (Rudstam et al. in press).

Though the scale method has been used for cisco since Van Oosten (1929), this method has recently been criticized for a lack of accuracy in aging some populations of coregonids, especially for older fish (Aass 1972, Power 1978, Mills and Beamish 1980). To test the validity of scale aging, a representative sample of 20 fish from each lake was aged using both scales and otoliths. Otoliths were heated on a hot plate until brown, cracked in median cross section through the nucleus, and viewed submerged in glycerine under a dissecting microscope (modified from Christensen 1964 and Power 1978). The annulus characters were discussed with Olle Enderlein (Freshwater Institute, Drottningholm, Sweden), who has used otoliths extensively for age determinations of the vendace, *Coregonus albula*.

No difference in the age assigned by scales and otoliths was found in the lakes with the fastest growing populations (Big Muskellunge and Sparkling Lakes, Table 2). Older fish from the slow growing populations in Pallette and Trout Lakes were difficult to age due to crowding of annuli on both scales

TABLE 3. Catch per unit effort (CPUE) of cisco in gill nets in 1930–32 and in 1981–82. The CPUE was calculated as the number of ciscoes caught in 100 square yards of netting of each mesh size set for 24 hours to allow comparisons with historical data. Only depths where the cisco were abundant were included. The catches in 1981 and 1982 are adjusted assuming the nylon nets are 1.33 times more efficient than cotton nets (Berst 1961). Source: Hile (1936) Table 44 and LTER—Northern Lakes (1981 and 1982).

Lake	*Year*	*Date (MM/DD)*	*Depth (m) included*	*Nets used*	*CPUE (1)*	*CPUE (2)*	*CPUE (3)*
Big	1930	08/28–29	9 –11	(4)	106.1	—	106.1
Muskellunge	1931	08/04–23	9.5–10	(4)	143.9	—	143.9
	1932	07/01–08/05	11 –13	(5)	93.4	135.4	135.9
	1981	07/31–08/02	9 – 11	(6)	86.5	121.8	444.0
	1982	08/17–19	11–13	(7)	13.8	18.4	41.5
Sparkling	1930	08/9–10, 08/15	10.5–15.5	(4)	81.6	—	81.6
	1931	07/17, 08/22	10.5–15.5	(5)	75.0	137.0	213.0
	1981	08/07–09	10 –16	(6)	19.6	38.0	136.2
	1982	08/03–05	10 –16	(7)	38.4	73.8	75.3
Trout	1930	07/29–31	15 –33.5	(4)	104.8	—	104.8
	1931	07/22–08/31	15 –33.5	(5)	75.8	136.8	137.8
	1981	08/10–12 08/18	15 –28	(6)	47.1	105.5	126.9
	1982	07/27–29	15 –31	(7)	76.1	121.1	122.2
Allequash	1930	07–08?	—	not reported	total catch 70 cisco		
	1981	08/04–06	0 – 7	(6)	0	0	0
	1982	08/01–03	0 – 7	(7)	0	0	0

1) CPUE in two nets with mesh sizes 38 and 51 mm stretch mesh.
2) CPUE in five nets with 32, 38, 51, 64, and 89 mm stretch mesh.
3) CPUE in all nets used.
4) 38 and 51 mm stretch mesh horizontal cotton nets.
5) 32, 38, 44, 51, 57, 64, and 89 mm stretch mesh horizontal cotton nets.
6) 19, 32, 38, 51, 64, 89, and 127 mm stretch mesh vertical nylon nets.
7) 19, 25, 32, 51, 64, and 89 mm stretch mesh vertical nylon nets.

and otoliths. Otolith readings often resulted in age assignments 1 to 3 years older than scale readings (Table 2). Older age assignments using otoliths have been observed elsewhere (Aass 1972, Erickson 1979). The Pallette Lake otoliths were unusually difficult to read (Enderlein pers. comm.). Since scale ages better corresponded to size frequencies, scales were considered to be more reliable than otoliths in that lake. The use of scales in the present study may have resulted in a bias towards 2 year olds in Pallette Lake and towards 3, 4 and 5 years olds in Trout Lake. Scales were, however, adequate for younger fish in these lakes and for all fish from Big Muskellunge and Sparkling Lakes.

Comparison with historical data

Size at capture in 1928–1932 was tabulated for comparisons with recent data. The sampling seasons for 1928–32 and for 1981–82 did overlap (Table 3). The standard lengths reported by Hile were converted to total length using a conversion factor of 1.18 (Hile 1936). Standard errors for the historical data were calculated from length frequencies (Hile 1936, Tables 21, 22, and 23).

Differences in fishing methods between the two studies could introduce systematic errors in comparisons of catch per unit effort (CPUE). Hile used 46 m wide and 2 m deep horizontal gill nets made of cotton, which were set along the bottom at specified depths. In 1981–82, 4 m wide and 18 m deep multifilament nylon nets set from surface to bottom were used. To minimize possible errors, only catches in identical mesh sizes were compared, and the CPUE were calculated according to Hile (1936). Hile reported the numbers of cisco caught in each mesh size per 24 hours and 100 square yards of netting in the water depth with the highest density of fish. This depth interval included most of the hypolimnion in Sparkling and Trout lakes, but only one to two meters at the bottom of the metalimnion in Big Muskellunge Lake. Thus, the CPUE values reported here are an index of maximum density during summer stratification. In addition, a correction factor for the documented higher efficiency of nylon versus cotton nets was introduced. Multifilament nylon nets have been reported to be from 1.33 to 3.2 times more efficient for coregonids as compared to cotton nets (Lawler 1950, Molin 1951 and 1953, McCombie and Fry 1960, and Berst 1961). Only one of these studies, however, involved cisco, and the ratio from that study (1.33, Berst 1961) was used to

TABLE 4. Number of fish of different species caught in gill nets during the two time periods. Only fish caught at depth occupied by cisco are included. Note that the sampling effort varies among lakes and time periods. Source: Hile (1936, Table 70) and LTER-Northern Lakes (1981 and 1982).

Lake	*Big Muskel.*		*Sparkling*		*Trout*		*Allequash*		*Pall.*	*Clear*
Year	*28–31*	*81–82*	*28–31*	*82–82*	*28–31*	*81–82*	*30*	*81–82*	*81*	*31–32*
Species:										
Cisco	1863	209	524	181	1197	449	70	—	143	465
Lake whitefish	—	—	—	—	32	5	—	—	—	—
Lake trout	—	—	—	—	32	—	—	—	—	—
Rainbow smelt	—	—	—	11	—	—	—	—	—	—
Yellow perch	1543	361	1	—	—	—	182	15	—	5
Walleye	—	—	—	—	—	—	22	—	—	37
Centrarchids 1)	22	—	—	—	—	—	23	1	—	1
Other sp. 2)	130	—	—	—	1	—	15	2	—	—

1) Centrarchids include: Rock bass, Large mouth bass, Small mouth bass, Bluegill, and Black crappie.
2) Other species includes: Burbot, Muskellunge, Golden shiner, and White sucker.

TABLE 5. Total length (mm) at capture of cisco from three Wisconsin lakes in 1928–32 and 1981–82. Mean and standard deviations of the lengths from 1928–32 were calculated from length frequency distributions. Standard lengths were converted to total lengths by multiplying with 1.18 (Hile 1936). The significance levels (P) are for the comparison of 1981 and 1982 with the year with the largest mean size 1928–32 using a two-tailed t-test. Source: Hile (1936) Tables 21, 22, and 23, and LTER—Northern Lakes (1981 and 1982).

Age	*1928*			*1930*			*1931*			*1932*			*1981*				*1982*			
	mean	*S.D.*	*N*	*mean*	*S.D.*	*N*	*mean*	*S.D.*	*N*	*mean*	*S.D.*	*N*	*mean*	*S.D.*	*N*	*P*	*mean*	*S.D.*	*N*	*P*
Big Muskellunge Lake:																				
0+	—			—			—			—			98.4	4.5	124	—	99.5	3.9	6	—
1+	161.0	14.6	19	174.1	10.4	17	159.7	4.2	9	164.8	9.4	15	187.3	6.9	61	***	192.8	12.5	8	**
2+	188.7	7.4	252	191.6	6.9	214	175.9	7.7	258	184.3	6.9	24	240.2	5.0	5	***	250.8	6.0	6	***
3+	201.2	9.2	70	196.2	5.5	14	196.1	5.9	347	—			280	—	1	—	—			
6+	—			—			—			—			—				313	—	1	—
Sparkling Lake:																				
0+	—			—			—			—			96.7	3.7	73	—	98.7	4.5	7	—
1+	—			—			166.3	7.4	63	—			195.4	13.6	35	***	176.6	6.9	52	***
2+	185.3	9.8	9	202.9	6.8	7	202.3	8.6	19	—			264.8	3.9	4	***	242.8	8.6	6	***
3+	195.2	8.4	46	213.6	10.8	25	207.2	7.4	61	—			303	—	1	—	287.0	12.0	3	***
4+	205.0	7.4	69	217.5	8.1	58	215.3	8.7	102	—			—				—			
5+	214.2	7.6	10	227.0	7.8	25	221.8	8.2	102	—			—				—			
6+	—			234.4	3.4	3	229.4	6.4	21	—			340	—	1	—	—			
7+	—			—			—			—			373	—	1	—	—			
Trout Lake:																				
0+	—			—			—			—			98.5	3.8	19	—	80	—	1	—
1+	149.9	—	2	151.0	8.3	2	—			—			150.0	4.0	55	N.S.	—			
2+	158.1	5.8	102	165.4	9.5	36	160.7	6.4	61	—			188.0	8.5	15	***	176.0	10.2	210	***
3+	168.3	4.9	61	175.8	6.7	347	167.6	6.1	173	—			197.7	6.8	41	***	197.3	9.5	31	***
4+	173.5	6.7	17	184.0	8.0	99	174.6	6.8	269	—			203.5	7.7	25	***	206.0	3.8	15	***
5+	—			197.0	13.5	9	184.0	7.0	79	—			205.3	4.5	9	N.S.	205.2	13.6	13	N.S.
6+	—			—			194.1	11.6	12	—			210.5	5.9	9	N.S.	199	—	1	—
7+	—			—			206.5	19.5	4	—			232	—	1	—	—			
8+	—			—			—			—			—				244	—	1	—

N.S. = not significant
* = $p<0.05$
** = $p<0.01$
*** = $p<0.001$

adjust the catches in 1981–82. Identical mesh sizes caught similar sizes of cisco in both studies.

Results

Cisco populations are still present in four of the five lakes investigated (Table 4). In Allequash Lake, however, the species has disappeared. The results on changes in growth and abundances are, then, from Trout, Sparkling and Big Muskellunge Lakes. The results from Pallette Lake were used primarily for the comparison of year class structure since Hile (1936) did not report size at capture or CPUE from this lake. Other information on the cisco population in that lake has been analyzed by Hoff and Serns (1983).

The lengths at capture of ciscoes I+ and older (Sparkling and Big Muskellunge) and II+–IV+ (Trout) were significantly greater both in 1981 and in 1982 compared to 1928–32 (Table 5, Figure 2). The significance levels given are for the comparison of 1981 and 1982 with the year having the largest length at capture in 1928–32 (2-tailed t-test, Table 5). Differences in age assignments of larger cisco may account for some of the differences observed in Trout Lake, but not in the other two lakes.

Catch per unit effort (CPUE) in gill nets appears to have declined in all three lakes (two way ANOVA, fixed model, Table 6 and Figure 3). Although an attempt was made to account for differences in fishing methods between the two studies, some bias may still be present. There are reasons to believe, however, that existing bias should be towards higher CPUE in 1981–82. Since growth has increased, the mesh sizes used in the comparison were more efficient for younger fish in 1981–82 than in 1928–32, which would tend to increase the CPUE in 1981–82. Thus, the observed decline in density may be underestimated. Another possible source of bias is that somewhat different areas within each lake were sampled. However, sonar charts showed an apparently uniform layer of ciscoes across the lake at night (Rudstam 1983). The ciscoes were caught almost exclusively at night in 1981.

Hile's (1936) findings of non-synchronous year class structure in four lakes in Vilas Co., were supported by this study (Figure 4). Although the populations in both Big Muskellunge and Sparkling Lakes were

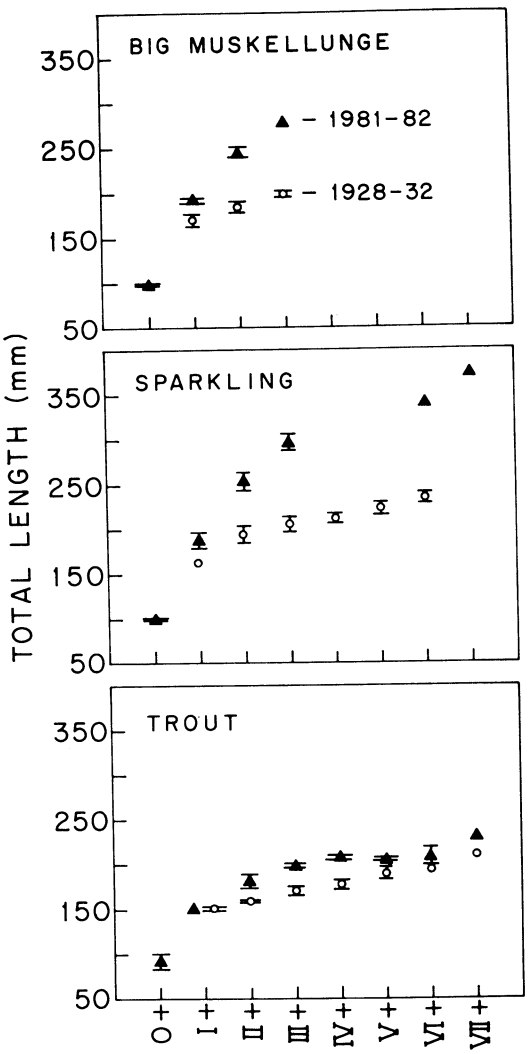

Fig. 2. Differences between 1928–32 and 1981–82 in the lengths at capture of cisco at each age in three Wisconsin lakes. Bars indicate the range of means for the two time periods.

dominated by a strong 1981 year class, the population in Trout Lake had a strong 1979 year class while the population in Pallette Lake had a strong 1978 year class. The 1981 year class was weak in Trout Lake. These results are based on younger fish where errors in aging should be minimal.

Discussion

The reasons for the disappearance of the Allequash cisco are not known. This lake was probably the least suited for a cold water fish such as cisco. It has a maximum depth of 7 m and can go anoxic below the epilimnion (occurred in 1981, LTER-

Table 6. Results from a two way ANOVA (fixed model) of catch per unit effort along lakes and between two time periods, 1930–31 and 1981–82. Log-transformed data give the same P-values.

Source of variation	*DF*	*SS*	*MS*	*F*	*P*
Among lakes	2	1716	858	1.14	N.S.
Between time periods	1	6833	6833	9.06	<.05
Interaction lake x time	2	1163	581	0.77	N.S.
Within groups	6	4523	753		

DF = degrees of freedom
SS = sum of squares
MS = mean square
N.S. = not significant

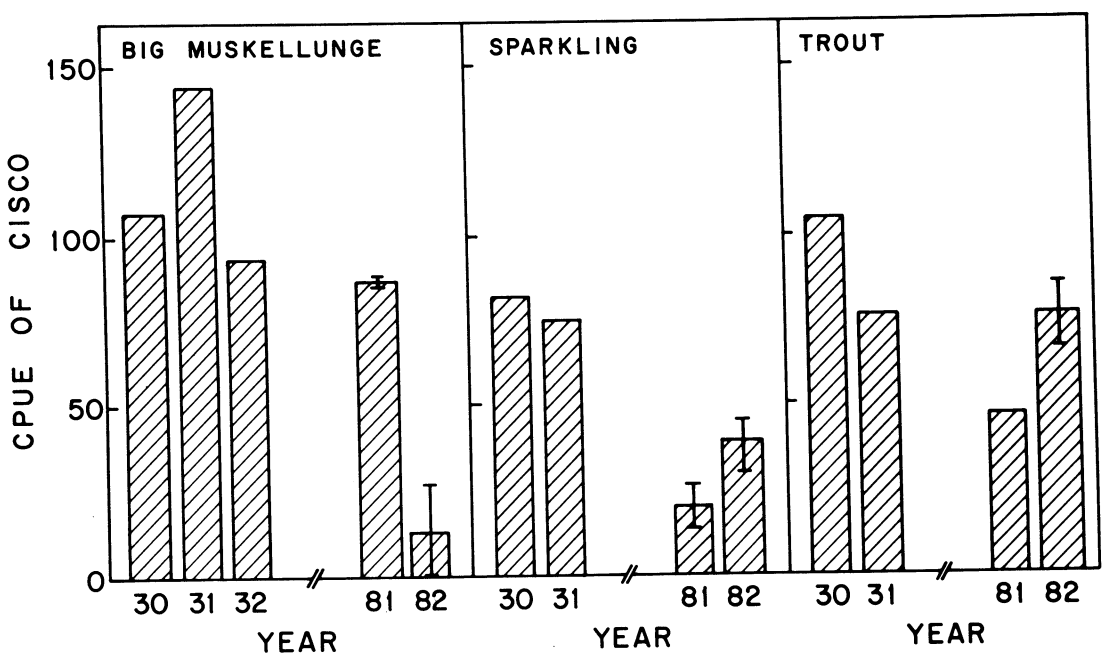

Fig 3. Catch per unit effort (CPUE) of cisco in three Wisconsin lakes in 1930–32 and 1981–82. CPUE is measured as catch per 100 square yards of gill net of mesh size 38 and 51 mm stretch mesh set for 24 hours. Only depths where the ciscoes were abundant are included. Thus, the CPUE is an index of maximum density during summer stratification. The catches in the 1980's are corrected for the documented higher efficiency of nylon nets compared to cotton nets (see text). The ranges for two sampling periods in 1981 and in 1982 are indicated with bars.

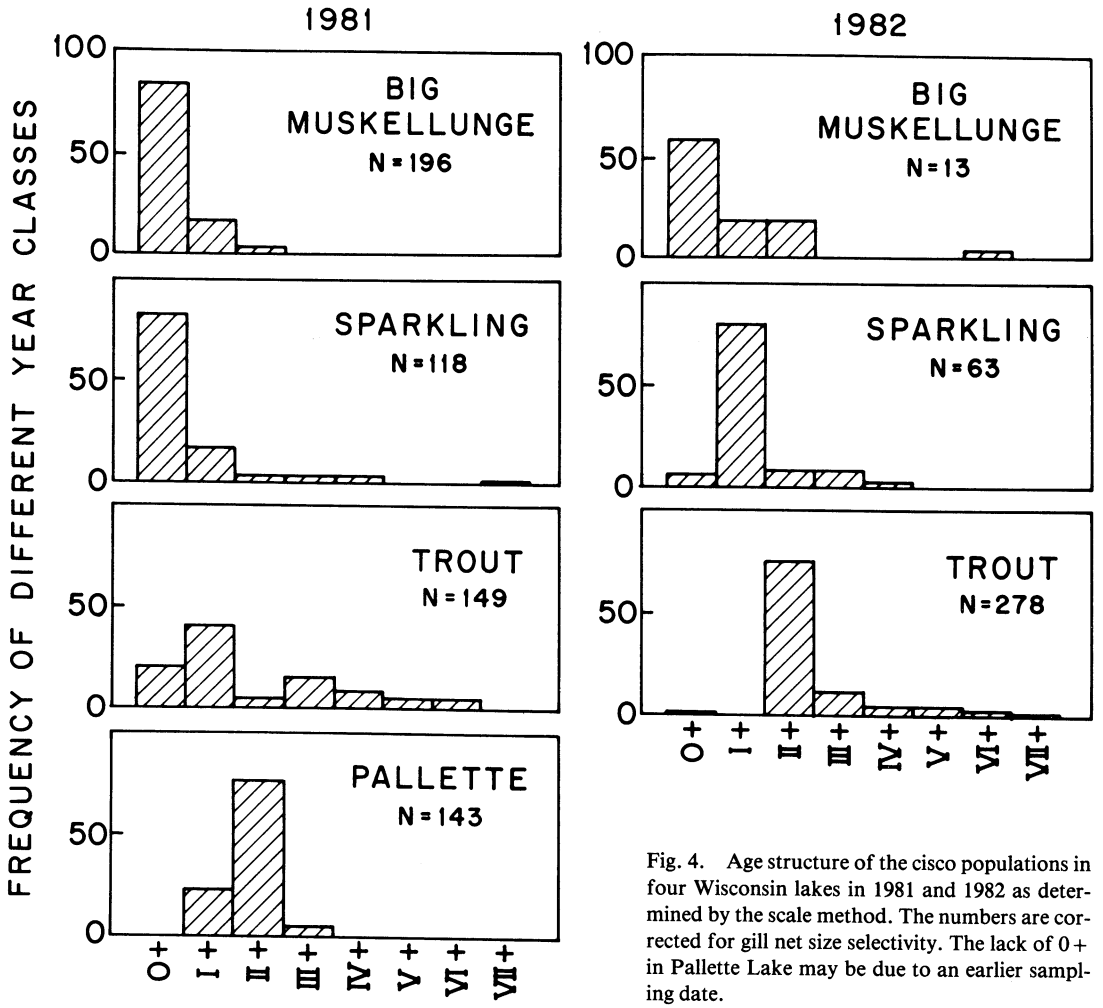

Fig. 4. Age structure of the cisco populations in four Wisconsin lakes in 1981 and 1982 as determined by the scale method. The numbers are corrected for gill net size selectivity. The lack of 0+ in Pallette Lake may be due to an earlier sampling date.

Northern Lakes 1981). Such conditions have been observed to cause summer mortalities of cisco in other lakes (Cahn 1927, Frey 1955, Colby and Brook 1969). However, cisco persist in similar lakes in Indiana (Hile 1936, Frey 1955). Also, recolonization from Trout Lake through Allequash Creek should be possible even if the whole population was eliminated through a summer kill. Conditions causing summer mortalities may occur too frequently to be offset by recolonization.

Growth and Density

An inverse relationship between growth and density of fish populations is well established and has been documented experimentally by Healey (1980) in a study involving different degrees of exploitation of lake whitefish (*Coregonus clupeaformis*) populations. Hoff and Serns (1983) observed a decrease in growth of Pallette Lake cisco following a substantial decrease in exploitation. Density was the only factor Hile (1936) found to correlate with the differences in growth observed among lakes in the 1930's. The decrease in density indicated by CPUE data is correlated with the observed increase in growth ($r = 0.776$, 4 df, $p < .10$, Figure 5). The decrease in CPUE is largest in Sparkling and Big Muskellunge Lakes where the in-

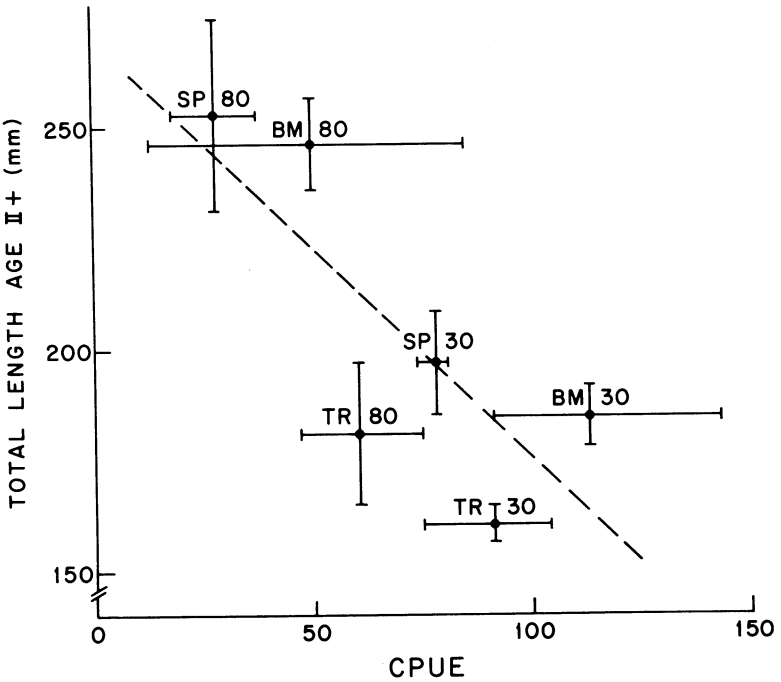

Fig. 5. Size at capture of age II+ cisco in July-August plotted against CPUE in Trout, Sparkling, and Big Muskellunge Lake ($r = .776$, 4 df, $p < .10$). CPUE is an index of maximum density during summer stratification (see text). Bars indicate two standard errors for the length measurement and the range for the CPUE. Abbreviations: SP = Sparkling Lake, BM = Big Muskellunge Lake, TR = Trout Lake, 30 = 1928–1932, 80 = 1981–82.

crease in growth is most dramatic. The CPUE and growth in these two lakes approach the values obtained from Clear Lake, Oneida Co, in 1931 and 1932 (Hile 1936), where, in the 1930's, the cisco were less dense and had a faster growth than any observed in 1981–82.

The increase in growth could be the result of other factors, such as more favorable temperature and oxygen regimes, increased productivity, and/or decreased inter-specific competition. None of these factors are, however, likely to have changed enough to have had a large effect on growth. The temperature and oxygen profiles measured in 1981–82 (LTER-Northern Lakes 1981 and 1982) are similar to the profiles reported by Juday and Birge (1932) and Hile and Juday (1941). Some increase in productivity may have occurred, since conductivity in two of the lakes has increased since the 1930's (Table 1, Carl Bower, UW Dept. of Geology, pers. comm.). However, this increase is a small fraction of the differences observed in conductivity among lakes. Preliminary analyses of zooplankton samples from the 1930's and 1981–82 show no significant differences in abundances of most taxa in the three lakes (T. Kratz and T. Frost, Trout Lake Station, pers. comm.). Inter-specific competition is unlikely to have decreased. Yellow perch, *Perca flavescens,* the other main planktivore in these lakes, were caught in large enough numbers to warrant any consideration of inter-specific competition only in Big Muskellunge Lake. Although Hile did not present any CPUE data for perch, he did give the number of perch caught with cisco

in gill nets. These numbers are similar per cisco caught in both time periods (Table 4). Rainbow smelt, *Osmerus mordax,* have been introduced into Sparkling Lake, which should increase rather than decrease interspecific competition in that lake.

Hence, a decrease in cisco density is probably the principal explanation for the increase in growth of cisco in the lakes studied here. However, since exploitation is limited or nonexistent, other explanations are necessary for this decrease in density.

The decrease in cisco density is most apparent in big Muskellunge and Sparkling Lakes, where the increase in growth rates is most dramatic. Predation pressure on these populations probably has increased. Predatory fish species have been stocked in these lakes on a number of occasions since the 1930's (Table 7). This has resulted in the establishment of a walleye, *Stizostedion vitreum,* and a muskellunge, *Esox masquinongy,* population in Sparkling Lake. Neither of these species were caught in Sparkling Lake in the 1930's (Hile and Juday 1941). Both species were present in the 1930's in Big Muskellunge Lake, but apparently in low numbers. Extensive gill net fishing caught only two walleyes and one muskellunge in the 1930's (Hile and Juday 1941). The density of these predators has probably increased. Hile (1936) hinted at the importance of walleye as a cisco predator, since substantially more walleyes were caught in Clear Lake (Table 4), where the cisco population was less abundant than in the other lakes. Clady (1967) observed an increase in growth of cisco when rainbow trout, *Salmo gairdneri,* were stocked in Birch Lake, Michigan, although few ciscoes were found in trout stomachs.

The density could also have been affected by a series of poor year classes that may or may not be the result of abiotic factors. Smelt, recently introduced to Sparkling Lake (Table 4), are thought to have contributed to the decline of cisco in the Great Lakes through resource competition (Christie 1974)

TABLE 7. Fish species stocked in Sparkling, Big Muskellunge and Trout lakes prior to 1931 and from 1932 to 1981. Stars indicate species that were not known from the lake prior to stocking. Source: Wisconsin Department of Natural Resources, Woodruff.

Lake	*Sparkling*		*Big Muskellunge*		*Trout*	
Species	*Year*	*# of occ.*	*Year*	*# of occ.*	*Year*	*# of occ.*
Prior to 1931:						
Salmon *(Salmo salar)*					*1906	1
Lake trout *(Salvelinus namaycush)*					1920	1
1932–1981:						
Lake trout	*1966–68	3			1942–80	25
Rainbow trout *(Salmo gairdneri)*					*1956	1
Whitefish *(Coregonus clupeaformis)*					1975	1
Muskellunge *(Esox masquinongy)*	*1939–77	10	1934–80	43	1949–67	8
Walleye *(Sizostedion vitreum)*	*1933–59	9	1934–81	6	1952–78	17
Perch *(Perca flavescens)*	1936	1				
Largemouth bass *(Micropterus salmoides)*	*1933–43	2	1942–45,64	4		
Smallmouth bass *(Micropterus dolomieui)*	1952	1	1950	1		
Bluegill *(Lepomis macrochirus)*	1936	1				

or through predation on cisco larvae (Crowder 1980). This species does not occur in Big Muskellunge Lake, but the same mechanism may not have caused the changes in population structure in both lakes.

The magnitude of the increases in growth observed in Sparkling Lake and Big Muskellunge Lake are quite large, comparable to the largest differences among years reported from other lakes (Carlander 1945, Dryer and Beil 1964, Clady 1967). There is, therefore, no indication that non-exploited cisco populations have a more stable population structure over time than exploited populations. However, the populations studied here cannot be considered unaffected by human activity. It is well known from the Great Lakes that introductions of new species may cause dramatic changes in native fish populations (see e.g. Christie 1974).

A posteriori explanations for historic changes are of necessity speculative. I consider a decrease in density to be the most parsimonious explanation for the observed increase in growth since the 1930's. The comparisons of CPUE's are consistent with this explanation. Several factors could have contributed to a decrease in density. The presently available information is consistent with an explanation based on increased predation pressure. However, other explanations can not be ruled out, and there is no guarantee that the same mechanism has caused the changes in both Sparkling and Big Muskellunge Lake. The changes in Trout Lake are of smaller magnitude and can probably be considered the result of "natural" fluctuations in abundance of cisco without larger changes in that system. Variations in growth of similar magnitude as observed in Trout Lake are commonly reported from long term studies on coregonids (Carlander 1945, Järvi 1942a, 1942b, 1947, Dryer and Beil 1964, Clay 1967). Unfortunately, it is not possible to know if the observed changes are the result of long term trends or part of a cycle, nor if the changes occurred slowly over the last 50 years or quickly over a few years. Complete time series are necessary for such detailed analysis.

Year class structure

The persistent asynchrony of year class strength among lakes in northern Wisconsin supports Hile's (1936) suggestion that year class strength of cisco is dependent on local conditions within each lake. This is also consistent with the lack of correlation between year class strength and weather found by some authors for the vendace, *Coregonus albula* (Svärdson 1956, Aass 1972, Hamrin 1979), an ecologically similar species (Smith 1957). Comparative studies among lakes can be criticized for not accounting for differences in the response of different lakes to weather events. A storm could, for example, affect lakes with a large fetch more than smaller lakes. However, the two lakes in this study with the most similar morphometries, Sparkling and Pallette Lakes, show different year class patterns. It appears, therefore, that variations in year class strength of cisco in lakes in northern Wisconsin are not primarily a response to weather events. Aass (1972) and Hamrin (1979) observed regular periods between strong year classes of vendace, that were not correlated with weather. Both authors invoked intra-specific competition as a possible mechanism for variations in year class success of this fish, since both adults and juveniles feed on zooplankton. This is also true for cisco in northern Wisconsin (Couey 1935, Engel 1976, Rudstam pers. obs.). Longer time series, however, are necessary to evaluate this proposition.

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THE DISTRIBUTION AND ZOOGEOGRAPHY OF LAKE TROUT, LAKE WHITEFISH, AND NINESPINE STICKLEBACK IN VILAS AND ONEIDA COUNTIES, WISCONSIN

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Abstract

Populations of lake trout, lake whitefish, and ninespine stickleback are uncommon in the Mississippi-Missouri watershed, and in many lakes their origin (native, introduced or recently invaded) is unclear. In the Mississippi basin of north-central Wisconsin at least eight lakes contained lake trout at some point during the last 80 years. In two of the lakes, Black Oak and Trout (Vilas Co.), the lake trout are probably native. Trout Lake also contains a native population of lake whitefish, and three ninespine stickleback have recently been captured there, the first record of the species in an inland lake in Wisconsin and only the fourth for the entire Mississippi-Missouri basin. There is some evidence that Trout Lake ninespine stickleback differ morphologically from the nearest other populations examined. Unlike in north-eastern North America, the distributions of ninespine stickleback and two other deepwater species in the Mississippi-Missouri watershed are not strongly correlated with the former distribution of large proglacial lakes, suggesting active dispersal into the area following deglaciation.

In addition to lake trout, lake whitefish, and ninespine stickleback, Trout Lake contains native populations of five other deepwater animals, giving it one of the most diverse deepwater assemblages in the Mississippi-Missouri basin. Future management of the lake should emphasize the preservation of this fauna, and particular effort should be made to prevent the introduction of rainbow smelt, which has become established in several lakes in the area.

INTRODUCTION

Although generally believed to have survived Wisconsin (late Pleistocene) glaciation in a Mississippian refugium, populations of lake trout *Salvelinus namaycush,* lake whitefish *Coregonus clupeaformis,* and ninespine stickleback *Pungitius pungitius* are today found in only a few deep lakes at the northern and western edges of the Mississippi-Missouri watershed (Lindsey, 1964; Nelson, 1968; McPhail and Lindsey, 1970; Martin et al., 1980; McAllister and Parker, 1980; Parker et al., 1980). Widespread introductions, possible recent invasions, mixing of stocks, local extinctions, and errors and omissions in the literature have obscured pre-Columbian distributions but it is almost certain that these species existed in only a handful of lakes in the basin before the advent of European settlement (Greene, 1935; Vincent, 1963; Nelson, 1968; Eddy and Underhill, 1974).

Factors affecting the post-glacial dispersal and distribution of these three deepwater fishes have been reviewed for northern and northeastern North America and the Laurentian Great Lakes basin (McPhail, 1963a; McPhail and Lindsey, 1970; Dadswell, 1972, 1974; Bailey and Smith, 1981). In the upper Mississippi drainage their zoogeography has received relatively little attention, primarily due to a scarcity of

records and uncertainty and confusion over origins of current populations (Greene, 1935; Lindsey, 1964; Eddy and Underhill, 1974; Becker, 1983). Historical records of lake trout and lake whitefish exist from a small number of lakes in the upper Mississippi basin of north-central Wisconsin (Birge, 1907; Wagner, 1910; Koelz, 1930; Green, 1935), but several general distribution studies on these species have disagreed over whether these populations were native or introduced (Lindsey, 1964; Martin et al., 1980; Parker et al., 1980; Becker, 1983; Black, 1983). Recent collecting has also revealed the presence of ninespine stickleback in the area. In order to clarify the status and origin of these populations, this paper summarizes the current and historical distribution of the three species in north-central Wisconsin and presents evidence that at least some of the populations were native. Particular attention is given to Trout Lake, Vilas Co., which has an unusually rich deepwater fauna.

Sources of Data

Current locality data for north-central Wisconsin (Figure 1) are based on 20 years

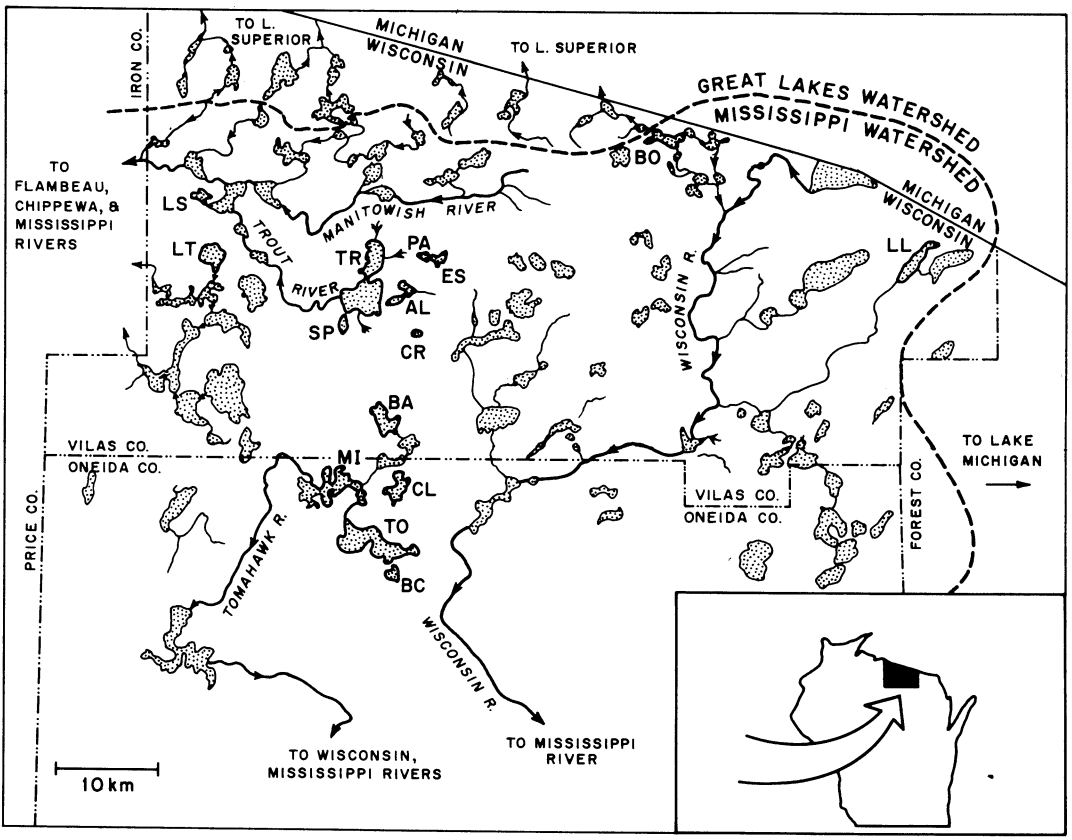

Fig. 1. Map of north-central Wisconsin, showing lakes mentioned in text, and watershed divides. Most of the many lakes and rivers in the area have been omitted for clarity. Labeled lakes are as follows:

AL = Allequash
BA = Big Arbor Vitae
BC = Big Carr
BO = Black Oak
CL = Clear
CR = Crystal
ES = Escanaba
LL = Long
LT = Little Trout
LS = Little Star
MI = Minocqua
PA = Pallette
SP = Sparkling
TO = Tomahawk
TR = Trout

TABLE 1. Location and selected physical, chemical and biological characteristics of lakes in the Mississippi basin of north-central Wisconsin which currently or historically had populations of lake trout, lake whitefish and/or ninespine stickleback. Origin of these three species is as follows: N = Native, NS = Native, but historically or currently stocked, I = Introduced, ? = Uncertain, ( ) = No longer present. Location and physical/chemical data from Black et al. (1963) and Andrews & Threinen (1966).

Lake	*County*	*Township/ Range*	*Area (ha)*	*Max. Depth (m)*	*Alkalinity ($mg/1CaCO_3$)*	*Conductivity (μm hos)*	*Origin of: Lake Trout*	*Lake whitefish*	*Ninespine Stickleback*	*Other Deepwater Species*
Big Arbor Vitae	Vilas	40N/7E	426	11	51	117			?	None
Big Carr	Oneida	38N/7E	85	22	3	16	(I)			Cisco
Clear	Oneida	39N/7E	420	30	10	27	(I)			Cisco, Burbot?
Black Oak	Vilas	43N/9E	220	26	38	85	NS			Cisco, Burbot?, *Mysis relicta*
Crystal	Vilas	41N/7E	36	21	2	15	I			None
Little Trout	Vilas	42N/5E	393	28	16	43	(?)			Cisco, Burbot?
Long	Vilas	41N/12E	349	29	34	79	(I)			Cisco, Burbot?
Minocqua	Oneida	39N/6E	514	19	35	86			?	Cisco, Burbot
Pallette	Vilas	41N/7E	69	20	13	26	I			Cisco, Burbot
Sparkling	Vilas	41N/6E	51	20	42	92	(I)			Cisco, Burbot, Rainbow Smelt
Tomahawk	Vilas	39N/7E	1450	24	47	106	(I)			Cisco, Burbot
Trout	Vilas	41N/7E	1548	36	27	63	NS	NS	N?	Cisco, Burbot, Troutperch, Slimy Sculpin, *Mysis relicta*

of fish collecting by the Wisconsin Department of Natural Resources (DNR) and University of Wisconsin (UW) students and faculty. The bulk of sampling has been on Trout Lake, Vilas Co., and has included bottom trawling, deepwater minnow trapping, gill netting, SCUBA observation, and examination of stomach contents of piscivores captured in deep water, as well as extensive netting and observation in littoral areas. Voucher specimens for all deepwater species collected can be found in the UW-Madison Zoological Museum, the UW-Stevens Point Museum of Natural History, the Milwaukee Public Museum and/or the University of Michigan Museum of Zoology. Native distributions have been determined from early literature reports, unpublished museum records, and communication with university and DNR biologists and geologists familiar with the region (see Acknowledgments).

Current and Historical Distributions

The lake trout is currently found in four lakes in the Mississippi basin of north-central Wisconsin. All are located in Vilas Co. and are relatively deep and unproductive (Table 1). Lake trout have been present continuously for at least 75 years in Trout and Black Oak Lakes, the only lakes in the upper Mississippi basin which currently support successfully reproducing populations (Birge, 1907; Daly et al., 1962; Becker, 1983; D. Fago, DNR Madison, pers. comm.; J. Underhill, University of Minnesota, pers. comm.). However, both lakes have been regularly stocked during this time period (Daly et al. 1962, McKnight 1977). In Crystal and Pallette Lakes current lake trout populations are due to recent stocking and natural reproduction is probably not significant. There were no records of lake trout in Pallette Lake prior to introduction in 1982 (S. Serns, DNR Woodruff, pers. comm.). Records from Crystal Lake date from the early 1900's, but there were apparently long periods between then and the present when lake trout were absent (Fago, pers. comm.). Lake trout were also recorded from Little Trout Lake, Vilas Co., in the early 1900's, but no longer occur there (Rahel 1982, Fago pers. comm.). In recent years several other lakes in the area, including Long and Sparkling Lakes, Vilas Co. & Tomahawk, Clear, & Big Carr Lakes, Oneida Co., have been stocked without notable success (Becker 1983, DNR Woodruff lake survey files).

The only lake whitefish population currently reported from the upper Mississippi basin of north-central Wisconsin is in Trout Lake, Vilas Co.; the earliest reports are from around the turn of the century (Birge 1907, Wagner 1910). The population reproduces naturally (Hile & Deason 1934) and has been stocked sporadically (DNR Woodruff lake survey files). In the last 40 years there have been single records of lake whitefish from Allequash and Little Star Lakes, Vilas Co. (Fig. 1), both of which are likely to have been strays from Trout Lake (McKnight et al. 1970, Becker 1983, Serns pers. comm.). In Minnesota and other parts of Wisconsin lake whitefish have been reported 25 km or more from established populations (Eddy & Underhill 1974, Becker 1983).

Previously there have been no confirmed records of the ninespine stickleback anywhere in the Mississippi watershed in Wisconsin, and only three reports of it the entire Mississippi-Missouri basin (Nordlie et al. 1961, Nelson 1968, Underhill pers. comm.). A published report from Escanaba L., Vilas Co. (Kempinger et al. 1975) is erroneous (G. Becker, UW-Stevens Pt. pers. comm.). During the last 20 years collections in Trout L., Vilas Co., have yielded three specimens, one in 1965 and two in 1968. Recent intensive sampling of both shallow and deepwater habitats has failed to capture further individuals, suggesting that the species is present at low densities or has been extirpated. There are also reports of single ninespine sticklebacks from Big Arbor Vitae Lake, Vilas Co. and Minocqua Lake,

TABLE 2. Selected counts and measurements for ninespine sticklebacks from Trout Lake and the nearest populations examined. Trout Lake data are for individual fish; for other localities the mean (mode for lateral plates) of a sample of individuals is presented with the range given parentheses. All measurements were from the left side and followed Hubbs and Lagler (1958) unless otherwise noted. Crooked Lake and Lake Michigan basin data are from Nelson (1968) while Lake Superior basin values are from McPhail (1963b).

UWZM = Univ. of Wisconsin-Madison Zoological Museum

UMMZ = Univ. of Michigan Museum of Zoology

Basin	*Capture Location*	*Disposition of Specimens*	*Standard Length (mm)*	*Pectoral Fin Length Pelvic Spine Length*	*# of lateral plates*	*# of dorsal spines*	*# of gill rakers*
Mississippi (Chippewa River)	Trout Lake Vilas Cty, WI	UWZM 7065	62.5	1.8 (right side)	Uncertain (damaged)	10	11
		UWZM 7896	52.0	1.4	0	9	13
		UWZM 7896	53.5	1.3	0	9	13
Mississippi (Ohio River)	Crooked Lake Noble/Whitley Co. Indiana	UMMZ #186442 to 186444 (N = 30)	52 (42–56)	1.9 (1.4–2.2)	No Data	8.9 (8–10)	13.1 (11–14)
Lake Michigan	Lake Michigan off Waukegan, Illinois	IL Natural History Survey (N = 30)	61 (49–74)	1.9 (1.5–2.3)	No Data	9.1 (8–10)	12.9 (11–15)
Lake Michigan	Gull Lake Kalamazoo Co. Michigan	UMMZ #55278 (N = 7)	60 (49–63)	1.5 (1.3–1.6)	No Data	8.9 (8–9)	13.9 (13–15)
Lake Superior	Amnicon River (Mouth, at Lake Superior Douglas Co., WI	UMMZ #80072 (N = 8)	No Data	1.8 (1.6–2.1)	0 (0–3)	9.4 (9–11)	13.0 (12–14)
Lake Superior	Lake Superior 46 30′ N Lat. 87 00′ W Long.	UMMZ #81703 (N = 23)	No Data	1.9 (1.7–2.2)	1 (0–4)	9.3 (8–10)	13.2 (11–14)
Lake Superior	Gratiot Lake Keweenan Co. Michigan	UMMZ #13301 (N = 11)	No Data	1.7 (1.4–1.8)	2 (0.4)	10.1 (10–11)	12.9 (12–14)

Oneida Co. (R. Steuck, H. Carlson, DNR, Woodruff, pers. comm.) (Fig. 1). Specimens are not extant, and thus cannot be confirmed, but if populations do exist in these lakes, it suggests that ninespine sticklebacks are present in at least small numbers in several lakes in this area.

Native Distributions

Lake trout are clearly not native to Pallette Lake and, given its small size and historical absence of reproduction, probably also not native to Crystal Lake. However, there is evidence that lake trout populations existed in Trout and probably Black Oak Lakes prior to European settlement of Wisconsin. Most recent literature reports consider lake trout native to these two lakes (Daly et al. 1962, Lindsey 1964, McKnight 1977, Becker 1983, Black 1983), which are unique in the upper Mississippi drainage in having naturally reproducing populations. In Trout Lake the earliest fish studies reported that lake trout were "native fish, not the result of artificial planting" (Juday & Wagner 1908, p. 19). Trout Lake was named by 1866 (Map of Federal Land Survey plots of Towns 40-43N, R1-8E Wisc, State Historical Society, Madison), well before any introductions were likely to have been made into the area (Jones 1924). Brook trout (*Salvelinus fontinalis*) are native to tributaries of Trout Lake, but are restricted to small streams and spring ponds in the area (Anonymous 1973, personal observations), so the name 'Trout Lake' probably arose due to the presence of lake trout. A similar 'name' argument can be made for nearby Little Trout Lake, which had lake trout in 1907 and 1909 (Fago, pers. comm.). However, the lake's name was changed from 'Sand' to 'Little Trout' sometime between 1866 and 1895 (Federal Plot Maps for Townships 40-43N, R1-8E) and it does not contain lake trout today (Rahel 1982), so the origins of the early records from this lake are uncertain.

The lake whitefish population in Trout Lake is also likely to have been present prior to settlement of the Vilas Co. area by Europeans. Lake whitefish were apparently not stocked as widely or as early in inland lakes as lake trout (Becker 1983), so early records are more likely to to give an accurate representation of their original distribution. The lake whitefish in Trout Lake currently reproduce naturally and have not been stocked in many years (DNR lake survey files). All early authors considered the population native (Wagner 1910, Koelz 1930, Hile & Deason 1934, Green 1935). Koelz (1930) recognized Trout Lake whitefish as a separate subspecies (*C. clupeaformis dustini*) from those in L. Michigan & L. Superior (*C. clupeaformis clupeaformis*), the most likely source of fish for any introductions into Trout Lake. Morphological differences between Trout Lake and Great Lake populations support a long isolation of Trout L. whitefish, but do not conclusively prove that Trout Lake fish did not recently come from the Great Lakes, as many of the morphological characteristics Koelz used in his corregonid taxonomy were shown to be caused by differing environmental conditions rather than by genetic differences between populations (Hile 1936).

The ninespine sticklebacks in Trout Lake were probably not introduced. Because of their small size and difficulty of capture, this species is not likely to be stocked, either intentionally or accidently as bait. Although only three specimens have been collected, the Trout L. population appears somewhat distinct morphologically from the nearest populations examined (Table 2). Trout Lake fish seem to have a relatively low ratio of pectoral fin length to pelvic spine length, and are similar to those of two small inland lakes in the Great Lakes basin, Gull and Gratoit, in that respect. However, they tend to have fewer dorsal spines then those from Gratoit Lake, and somewhat different numbers of dorsal spines and gill rakers than those from

Gull Lake. As in the lake whitefish, morphological differences support the native status of Trout Lake ninespine sticklebacks, but do not prove that they were not introduced into the lake, particularly given the small samples being compared. Among other species of sticklebacks nearby populations in the same drainage are often quite different morphologically (Reist, 1981; Bell, 1982) and some population characteristics, such as frequency

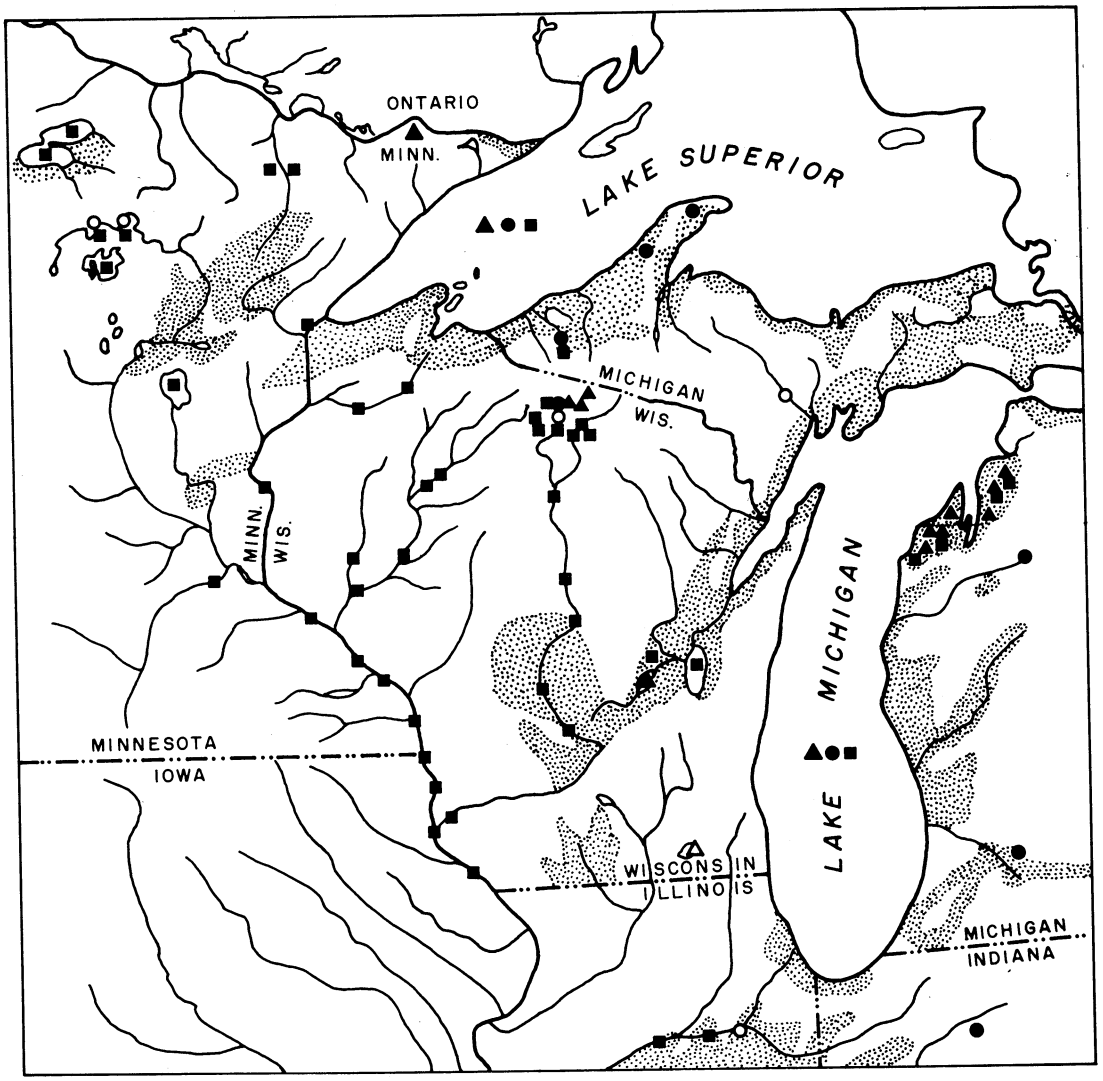

Fig. 2. Map of extent of glacial lakes (Stippled Areas) in the north central United States during late Wisconsin glaciations (after Flint 1969). Current localities for ninespine stickleback (●). trout-perch (■) and the crustacean *Mysis relicta* (▲) are plotted. Unconfirmed records, strays, or possibly introduced populations have an open symbol. Not all trout-perch records have been plotted.

Sources of records: Eschmeyer, (1950); Nelson, (1968); Eddy & Underhill, (1974); Becker, (1976), McKnight, (1976); Gammon et al., (1978); Smith, (1979); Gilbert & Lee, (1980); McAllister & Parker, (1980); Rahel, (1982); Becker, (1983); personal observations.

of certain pelvic-complex phenotypes, change rapidly in response to environmental changes (Kynard, 1979; Reist, 1981).

Origins of Native Populations

In northeastern North America Dadswell (1972, 1974) found that the distribution of several small deepwater fishes and crustaceans agreed closely with the former distribution of large proglacial lakes. In that area these animals dispersed northward following glaciation via interconnected proglacial lakes and their outlet channels, although several fishes later moved up to 60 km upstream from the boundaries of these former lakes.

Three of the species considered by Dadswell (1972, 1974), ninespine stickleback, trout-perch (*Percopsis omiscomaycus*) and the crustacean *Mysis relicta,* are present in the upper Mississippi basin of north-central Wisconsin. The trout-perch clearly is not distributed in accordance with former proglacial lakes in the Mississippi basin (Fig. 2). With the exception of northern Wisconsin and Minnesota it is primarily a river fish, and is found several hundred km south of the southern edge of the Wisconsin ice sheet (Gilbert & Lee 1980). In north-central Wisconsin it is distributed sporadically in scattered rivers and lakes (Rahel 1982, Becker 1983), and appears to have dispersed following deglaciation using lotic pathways.

Mysis relicta is known from only three or four lakes in the Mississippi basin of Wisconsin, including Trout and Black Oak Lakes (Juday & Birge 1927, McKnight 1976). Its distribution, along with that of the ninespine stickleback, does not correspond with that of large proglacial lakes in the Mississippi basin (Fig. 2). Geological studies of north-central Wisconsin indicate that large proglacial lakes were absent following glaciation, and that most lakes in the region were formed by the melting of ice blocks deposited in the glacial till as the ice withdrew (Thwaites 1929, Broughton 1941, J. Attig U.W. Dept. of Geology pers. comm.). Dadswell (pers. comm.) has suggested that short-lived narrow proglacial lakes may have been present along large areas of the ice margin in relatively flat areas such as northern Wisconsin. However, the local topography in Vilas Co. makes formation of such lakes unlikely, and recent core and sediment samples provide no evidence that such lakes ever existed (J. Attig, pers. comm.).

While several of the lake trout, lake whitefish, and ninespine stickleback populations in the Mississippi basin of north-central Wisconsin were probably not the result of stocking, it is possible that they may have arisen from a relatively recent invasion into the Mississippi drainage from the Great Lakes basin. The ninespine stickleback population in Lake Winnibigosh MN may have entered the Mississippi drainage by moving through a marshy connection with the Hudson's Bay watershed (Nordlie et al. 1961) while several other species have crossed the Mississippi-Great Lakes boundary in Wisconsin and Illinois during the last 100 years (summarized in Smith 1979, Becker 1983). Black Oak Lake is less than 2 km from the Great Lakes drainage (Fig. 1), so a movement of lake trout into the lake across the watershed boundary might not be unlikely. However, by current drainage patterns Trout Lake is over 30 km from the nearest likely crossover point (Fig. 1). Most of this distance is unsuitable habitat for deepwater species, although the probable movement of lake whitefish from Trout Lake to Little Star Lake indicates that it might be traversed during colder parts of the year.

Geological studies indicate that in the period immediately following the recession of the glaciers, the drainage divide was 20-30 km further north, and that its current position is probably as far south as it has ever been (J. Attig pers. comm.). There have been no major connections between the two watersheds since deglaciation, and any recent connections have almost certainly been small, shallow and marshy. These

factors argue against movement of deepwater fishes from the Great Lakes Basin into the upper Mississippi drainage in this area. Deepwater fishes most likely actively followed the glaciers northward from southern refugia using lotic pathways and colonized lakes in north-central Wisconsin soon after they were formed. Native populations in this area have persisted since then and have probably been isolated from Great Lakes populations since glaciers left the Vilas Co. area, 10-12,000 yrs. before present (J. Attig pers. comm.).

Trout Lake

Trout Lake has one of the most diverse native deepwater faunas in the entire Mississippi-Missouri basin. In addition to lake trout, lake whitefish, ninespine stickleback and *Mysis relicta,* there are reproducing populations of cisco (*Coregonus artedi*), trout-perch, burbot (*Lota lota*), and slimy sculpin (*Cottus cognatus*). Cisco, trout-perch and burbot are common in many deep lakes in northern Wisconsin and Minnesota, but in the upper Mississippi watershed the slimy sculpin is usually restricted to small cold headwater streams 300 to 500 km to the southwest (Johnson 1972, Eddy & Underhill 1974, Becker 1983). Slimy sculpins from Trout Lake are somewhat different morphologically from most Great Lakes and Mississippi basin populations (Lyons, in prep.).

Future fisheries management policy for Trout Lake should take into account the uniqueness of its deepwater fauna and attempt to preserve it. Efforts should be made to keep the numbers of piscivores and prey fairly stable, and in the future the DNR should not introduce lake trout except those derived from Trout Lake brood stock. Horns (1983) has shown that hatching and developmental characteristics of Trout Lake lake trout are different from those of Lake Superior and Lake Michigan fish. Further dilution of the particular genetic characteristics of the Trout Lake population through mixing with other populations may lead to reduced reproductive success, as suggested by the failure of recent efforts to reestablish a reproducing population of lake trout in Lake Michigan (Krueger et al. 1981). The introduction of exotic deepwater species into Trout Lake should be avoided at all costs. Rainbow smelt *(Osmerus mordax)* have become established in several lakes in north-central Wisconsin (Becker 1983), including adjacent Sparkling Lake (pers. observation, Fig. 1). In the Great Lakes rainbow smelt, along with other exotic fishes, are believed to have contributed to the decline, and in some cases the extirpation of the native deepwater fish fauna (Christie 1974, Crowder 1980). During highwater years there is a temporary connection between Sparkling and Trout Lakes (present for 3 mos. in 1983) which rainbow smelt might traverse during their spawning period. To prevent them from entering Trout Lake fish barriers should be installed and the connection should be monitored when flowing. Efforts also should be made to educate the public about the dangers of intentionally or accidently introducing rainbow smelt into other lakes in the area.

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THE CRYSTALLINE MONADNOCKS OF NORTH-CENTRAL WISCONSIN

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Abstract

Located within ten miles of Wausau, Wisconsin are three crystalline quartzite monadnocks—Rib Mountain, Mosinee Hill and Hardwood Hill. This paper is a geographical analysis of these hills stressing their physical and economic features. A review of existing literature preceded map study, air photo examination, personal interviews and field work of these unique landforms.

Composed of resistant Rib Mountain quartzite, the monadnocks exhibit higher elevations, greater relief and steeper slopes than the surrounding landscape. Metamorphosed from ancient sandstones, the quartzite was later recrystallized by igneous intrusions and exhibits great purity. Glaciation of the area apparently occurred in Pre-Wisconsinan time and deposited a shallow drift. Surveyor's notes indicate the original vegetation was a dense hemlock/northern hardwood forest. However, a fire destroyed most of the cover in 1910 and the resultant growth was largely aspen, birch and shrubs. Shallow, moderately-steep, stony silt loam soils (Typic Glossboralf) dominate the hills.

Use of the monadnocks for agriculture has been generally precluded by the steep slopes and stony soils. The lumbering "boom" of the late 1800's largely avoided the hills. Occasional forestry operations by private owners have been carried on in recent years. Mining of quartzite commenced in 1893 and several companies have been involved over the years.

It is in the fields of recreation and communications that the monadnocks have had the greatest economic impact. Rib Mountain State Park dates from 1927 and served 189,000 visitors in 1979. The Rib Mountain Ski Area with four major slopes entertained 97,000 skiiers in a recent year. Serving as a hub for a complex communication network, the "mountain" supports a number of transmitters and microwave facilities for television, radio and telephone.

INTRODUCTION

As one approaches Wausau, Wisconsin, from any point of the compass, even the most casual observer soon becomes aware of three brooding, heavily-forested, steeply sloping prominences which dominate the landscape of the area. Projecting above the flat-topped upland of the Precambrian peneplain, they are the sharp, ridge-like Rib Mountain, the twin-peaked Mosinee Hill and the smaller, conical Hardwood Hill (Fig. 1). These unique landforms consist of the very coarse Rib Mountain quartzite, perhaps the most resistant rock in nature, and for this reason they maintained their presence during the general degradation of the surrounding area in Precambrian time and remain as remnant hills, or monadnocks, today. The hills are in marked contrast to the relatively level tops of the upland forming the peneplain. They are the remnants of a land surface older than the present peneplain and are typical monadnocks like their namesake, Mount Monadnock in New Hampshire, which bears a similar relationship to

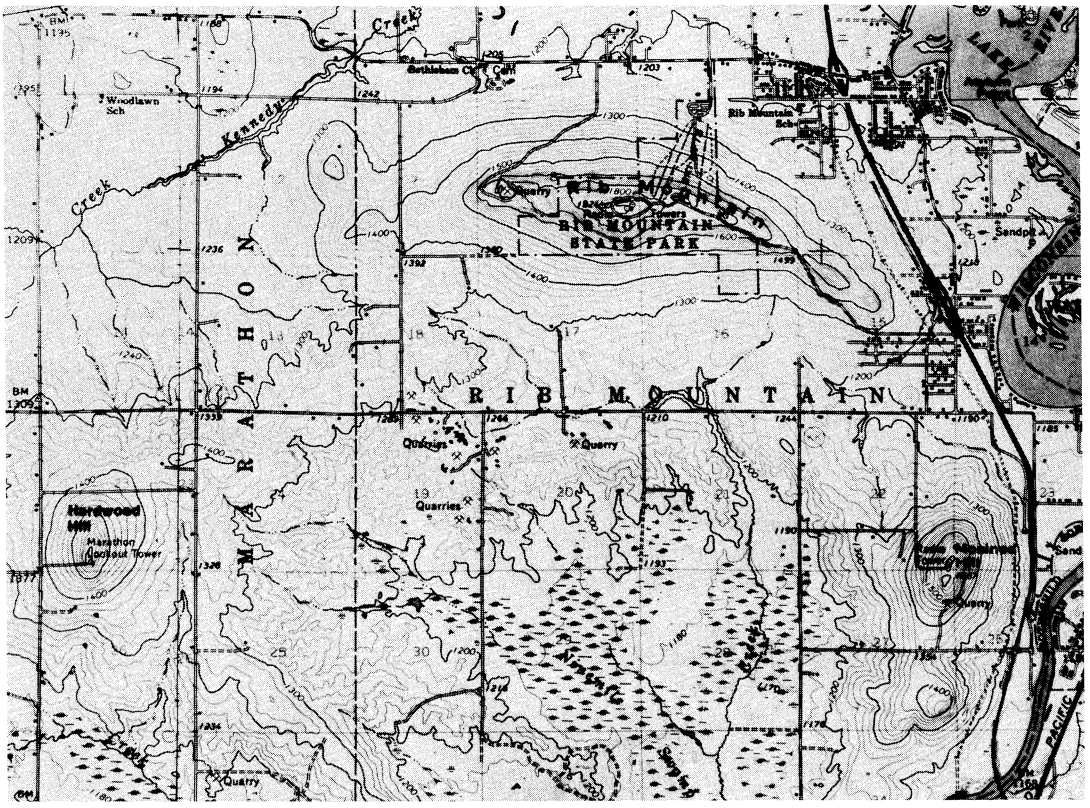

Fig. 1. The crystalline monadnocks of north-central Wisconsin (from USGS Wausau and Marathon Quadrangles, Scale-1:62,500).

the peneplain of erosion in southern New England. It will be the major purpose of this paper to provide a geographical analysis of the hills which emphasizes their physical and economic characteristics. In addition, a brief review of the geology of the area is included.

Physical Environment

Landform Geography

Largest of the monadnocks is Rib Mountain which is located in central Marathon County approximately four miles southwest of downtown Wausau (Fig. 2). Formerly called Rib Hill, then Rib "Mountain," this prominence is now called Rib Mountain. Less than a mile from the Wisconsin River (i.e., Lake Wausau), the "Mountain" extends four miles east-west and one and one-half (1½) miles at its maximum width north-south. Slightly arc-like in form, which has been likened to a human "rib," its total area is 3.63 square miles. The fame accorded Rib Mountain, however, tends to be based rather on its vertical dimensions—elevation and local relief. For many years it was recognized as the highest point of elevation in the State of Wisconsin at 1,940 feet above sea level. However, a number of years ago U.S. Geological Survey investigators identified two hills northwest of this area (Tim's Hill and Pearson Hill in Price County) which have slightly higher elevations. Rib Mountain still enjoys the distinction of possessing the greatest local relief in the state as it rises 780 feet above Lake Wausau and about 650 feet

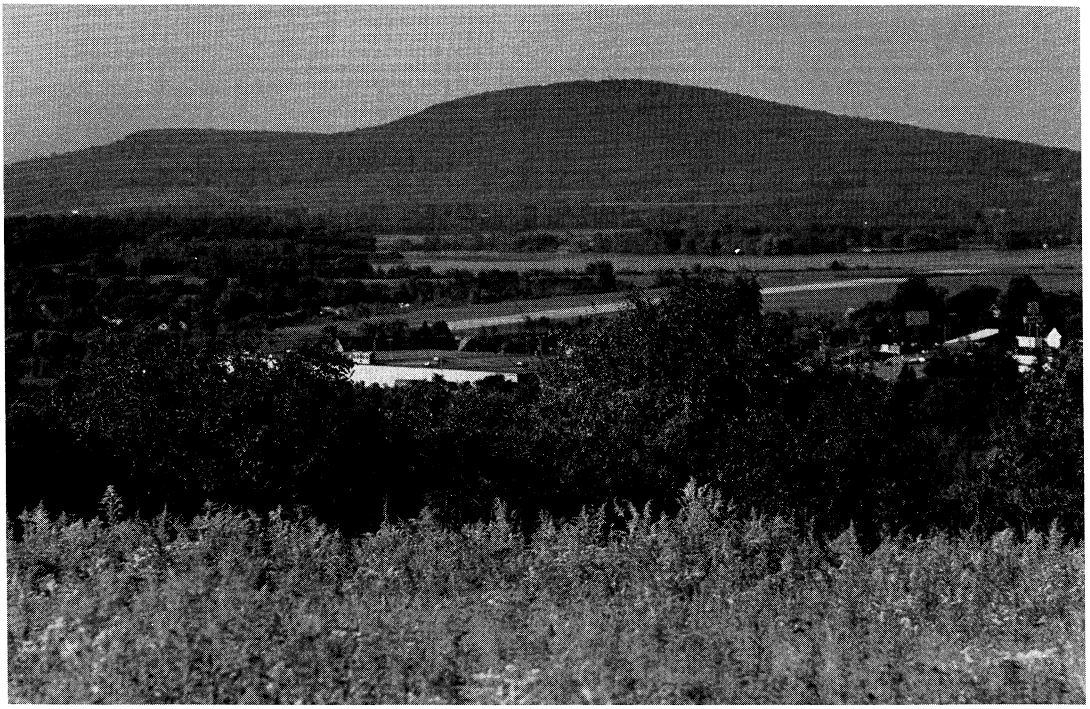

Fig. 2. Rib Mountain, from the northeast.

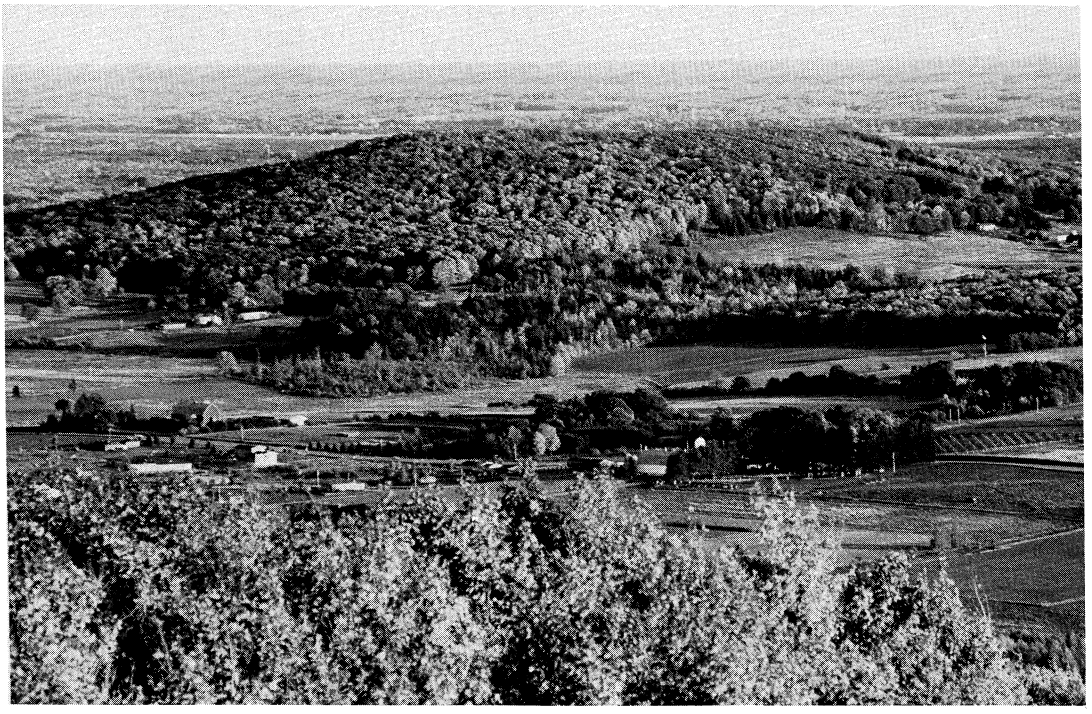

Fig. 3. Mosinee Hill, from the tower on Rib Mountain to the northwest.

above the average level of the crystalline peneplain. This landform feature also includes some of the steeper slopes to be found in northern Wisconsin. Areas near the summit on both the north and south flanks are covered by a talus of quartzite blocks and exhibit slopes of 20 to 30% with the north slope being steeper. A majority of the "Mountain's" total area displays 12 to 20% slopes while near the base 6 to 12% is more common.

Located one and one-half (1½) miles south-southeast from the eastern end of Rib Mountain and only several hundred yards from the west bank of the Wisconsin River is the second of the monadnocks, Mosinee Hill (Fig. 3). Two summits, located about one mile apart, are seen on the hill which led them to be identified in earlier times as Upper and Lower Mosinee Hills. They are connected by a continuous stretch of quartzite although separated from Rib Mountain by a lower area of quartz syenite bedrock. The northern summit is the larger of the two and reaches an elevation of 1,610 feet above sea level and rises 465 feet above the alluvial plain of the Wisconsin River nearby, while the southern summit has an elevation of 1,472 feet and a relief of only 325 feet. Both of these hills are more gently-sloping on their western flanks (i.e., 2 to 12%), while their eastern sides adjacent to the river possess steeper slopes (i.e., 12 to 20%). Like Rib Mountain, Mosinee Hill's upper levels are covered with a talus deposit of quartzite blocks, but its total area is considerably smaller occupying 1.18 square miles. Aligned north-south its maximum length is one and three-quarters (1¾) miles and varies from ¾ to one mile in width.

Smallest of the three monadnocks is Hardwood Hill which is located three and one-half (3½) miles in a west-southwesterly direction from the summit of Rib Mountain (Fig. 4). While the two hills previously described are largely in the Town of Rib

Fig. 4. Hardwood Hill, from the east.

Mountain, Hardwood Hill is in the Town of Marathon. Dome-like in form and covering only one-half (½) square mile, the top of the hill has an elevation of 1,610 feet which is 300 feet above the peneplain surface and about 400 feet from the valley floors within a mile or two of the summit. Slopes vary from 12 to 20% near the summit to 6 to 12% on the flanks of the hill. Quartzite blocks are frequently seen near the summit.

Quartzite bedrock with its superior resistance to erosion is certainly responsible for the higher elevations and considerable relief of the hills. The three monadnocks give to the Wausau area Wisconsin a rather unique topography that may be better described as "plains with high hills" instead of as a rolling plain which is more characteristic of most of northern Wisconsin.

Geology Review

The geologic formation responsible for the three monadnocks is Rib Mountain quartzite, an extremely resistant Early Proterozoic (Middle Precambrian) metamorphic rock. Metamorphosed from ancient sandstones and recrystallized more recently, the quartzite is remarkably pure (99.07%SiO_2), white to pale pink in color, vitreous and firmly cemented (Weidman 1907). It varies from medium-grained to coarse-grained with the latter predominating. Quartz crystals range from 3 to 8 millimeters in size. Nevertheless, though being extremely resistant to weathering, the quartzite is somewhat brittle and because of this is often seen as talus on the steeper slopes. Jointing in the quartzite is common but no persistent pattern of jointing is noted. The monadnocks are composed of masses of nearly vertical south-dipping quartzite with an estimated thickness of from 1,000 to 4,000 feet (Weidman 1907). Age of the formation is placed from 1.45–1.50 billion to 1.64–1.67 billon years, probably nearer the latter (LaBerge and Meyers 1972). The large quartzite block at Rib Mountain, and several others nearby, were once part of the roof rock above a syenite intrusion (i.e., Wausau quartz syenite—1.45 to 1.50 billion years old) (Paull and Paull 1980). When erosion breached the roof rock, the underlying intrusive was removed much more rapidly than the resistant quartzite. In time, isolated masses of quartzite stood high above the general erosional surface. It has also been hypothesized that the three monadnocks may be connected at sub-surface levels but no substantive evidence has yet been presented.

Samuel Weidman, author of "Geology of North-Central Wisconsin" (1907), the definitive work on this region, was convinced that this locality was part of the Driftless Area and so mapped it. The absence of quartzite boulder trains marginal to the three monadnocks furnished, he thought, the strongest kind of evidence of the non-glaciated character of the vicinity. Later research by Thwaites (1943) and Hole (1943) suggested that the extension of the Driftless Area along the Wisconsin River valley from Stevens Point to Merrill was glaciated in early Wisconsinan time, possibly Altonian, but as a result of severe erosion by the Wisconsin River and its tributaries most of the drift had been removed. More recent investigations indicate that a pre-Wisconsinan glacial advance moved eastward across this area (Mickelson, Nelson and Stewart 1974). Wausau Drift is the name applied to the thin, discontinuous till deposited by this ice sheet that rests directly on deeply weathered, Precambrian rocks (LaBerge and Meyers 1972).

Vegetation

Federal land surveyors' notes reported that the natural vegetation of Rib Mountain in 1840 was a hemlock/northern hardwood forest. Presumably, Mosinee and Hardwood Hills supported a similar forest community. Included among the hardwoods were yellow birch, sugar maple, red maple, white ash,

basswood and white birch. Due to their steep and rocky slopes, the monadnocks were largely bypassed by the loggers of the late 1800's, and the forest remained essentially in its native state until 1910. In late July of that year, however, following a severe drought period, a disastrous crown fire destroyed nearly all of the canopy trees on the "Mountain" (Schaetzl 1980). Mosinee and Hardwood Hills were not affected by this conflagration.

Vegetation growth after the fire was dominantly aspen, with considerable white birch and various shrub species. The vegetation remained in this state for nearly twenty years. Upland hardwoods fringed the base of the hill and continued to gain in importance. In 1927, Rib Mountain State Park was established, and the natural succession of vegetation has been encouraged within its boundaries.

A map of forest types prepared for the park in 1971 revealed the continued advance of northern hardwoods up the slopes of the hill. Yet, many areas were still dominated by white birch and aspen. A map compiled by Schaetzl (1980) confirmed the nearly complete dominance of northern hardwood communities on the more gentle slopes while white birch/mountain maple and aspen/white birch/yellow birch communities were predominant on the steeper north and south slopes, respectively. Well over three-quarters of the total area of the monadnocks still supports a forest cover today.

Soils

Soil mapping of Marathon County is currently in progress, and coverage of the three monadnocks is complete. In the area is a group of soils that have developed in part from weathered bedrock or shallow till. A silty covering about two feet thick often overlies these parent materials and probably originated as a local, non-calcareous loess. As a result, moderately-deep to deep, moderately-steep to steep, stony, Gray-Brown Podzolic (mostly Typic Glossoboralf) soils cover the hills. Ribhill, Fenwood, Rietbrock and Sherry are the principal soil series. A summary of the major soil types of the monadnocks including land use capability ratings and current uses appears in Table 1.

Economic Geography

Agriculture and Forestry

Utilization of the monadnocks for agriculture has largely been precluded by the steep slopes, stony soils and dense forest vegetation. Only along the base of the hills have the farmers cropped and pastured the land. They cultivate up to the level where the soils become too shallow or stony. A number of stump pastures are present around the base of Rib Mountain and while some have been cleared for cropland most of the acre-

Table 1. Major Soils of the Crystalline Monadnocks of North-Central Wisconsin.

Soil Type	*Topographic Position*	*Capability Rating*	*Current Use*
Ribhill stony silt loam	Summit and steep talus slopes	6,7	Woodland
Fenwood stony silt loam	Intermediate slopes	6, 7	Woodland
Rietbrock stony silt loam	Lower slopes	5	Woodland
Sherry stony silt loam	Lower slopes	5	Woodland
Fenwood silt loam*	Lower slopes, marginal	2, 3	Cropland, Woodland
Mosinee loam*	"Sag" area, Mosinee Hill	3, 4	Cropland

* Limited acreage

age remains in permanent pasture. Many farmers own land farther up the slopes but since they cannot utilize it for crops or pasture they have wisely left it in forest. At the present time there are four farmsteads on Rib Mountain (all near the western end), four on Mosinee Hill (located on the gentler western slopes and "sag" area) and none on Hardwood Hill.

Following the ruinous forest fire of 1910, loggers moved in and by the latter part of 1911 had removed all of the salvable timber from Rib Mountain (Schaetzl 1980). An inventive operator devised a wooden chute that made it possible to slide large logs down the steeper slopes allowing for more rapid removal. Occasional forest harvesting operations have been carried on by private owners in recent years. Minnesota Mining and Manufacturing Company (3M) has cut timber selectively on its two properties on Rib Mountain, and the Tigerton Lumber Company owns 144 acres of forest land on the western end of the "Mountain." A private owner has engaged in selective cutting of timber on Hardwood Hill recently (Brechler 1981, personal communication). A fire tower was constructed on Hardwood Hill to serve central Marathon County but is now abandoned.

Mining

Mining (or quarrying) of quartzite on Rib Mountain and Mosinee Hill began near the end of the last century, and several companies have subsequently been engaged in

Fig. 5. Quartzite quarry on the northwestern slope of Rib Mountain.

this activity until quite recently. The Wausau Sandpaper Company commenced production in 1893 using quartzite blocks hauled from Rib Mountain to their factory in Wausau (Marchetti 1913). Later they opened a small quarry on the northeastern section of the hill. By 1910 the company was producing 9,000 sheets of sandpaper a day based on the excellent quality of the ground quartzite. In 1901 the Wausau Quartz Company started production of crushed quartz at their ball mill in Wausau (Marchetti 1913). All grades from finest powder up to ¼ inch diameter were ground from quartzite obtained from their two properties on Rib Mountain. The various abrasive purposes for which the quartz was utilized included the manufacture of flint sandpaper, sand blasts, sand belts, pumice stone, marble cutting and match sand. Additional uses for the crushed quartz were for filters, bird grit, wood fillers and stone facing.

Minnesota Mining and Manufacturing Company (3M) purchased 281 acres on the north slope of Rib Mountain in 1929 in order to establish a quarzite quarry (part of the acreage had been owned by the Wausau Quartz Company) (Fig. 5). Operation of the quarry was continuous until 1976 and in that period about one million tons of quartzite were removed to be ground into sandpaper grit. Company officials indicate that production may resume at some future date if the need arises. Duffek Sand and Gravel Company of Antigo operated a quarry on the south end of the northern summit of Mosinee Hill for a short time to procure road aggregate. It was closed after a petition of nuisance was circulated by nearby land owners.

Five exploratory shafts and drifts were opened on Rib Mountain in attempts to strike gold ore of commercial richness; the first as early as 1897 (Berger 1979). One of the abandoned shafts is located just north of the State Park road. Unfortunately, none of the ventures "panned" out although one of the mines was reported to have been salted with California gold dust in an attempt to lure unwary investors.

Recreation

The heart of recreational development is Rib Mountain State Park which occupies 860 acres on the summit and north and south slopes. Inception of the park dates from 1923 when forty acres were given to the state by the heirs of the Jacob Gensman estate for that purpose. Four years later in 1927, it officially became a state park. Completion of a winding three-mile road up the east side of Rib Mountain in 1931 gave the public access. Six subsequent gifts of land by individuals, a club, corporations and Marathon County plus Department of Natural Resources land purchases totalling $164,000 expanded the park to its present size. The park includes a 31-unit campground, 3.1-acre picnic area, 3,200-foot nature trail with signs, 1.25-mile snowmobile trail, 2.5-mile hiking trail and a forty-foot tower with three observation platforms that affords a 30-mile view. Table 2 summarizes attendance at Rib Mountain State Park in recent years (Wisconsin Blue Book 1981).

A newly-proposed master plan for Rib Mountain State Park calls for a $1,000,000 expansion and improvement over the next two decades. Total area of the park would be increased from the present 860 acreas to 1,219 acres at an estimated cost of $500,000. However, private development is encroaching on some boundary areas of the park and causing land values to soar. Improvements called for include expanded day use, new water system, expanded picnic area, new

TABLE 2. Visitor Attendance at Rib Mountain State Park*

1966—115,571	1972—251,807	1978—271,061
1967—142,624	1973—204,400	1979—189,475
1968—163,266	1974—199,837	1980—199,224
1969—211,613	1975—195,216	1981—204,743
1970—221,149	1976—240,871	1982—221,333
1971—262,137	1977—221,782	1983—194,995

* Includes skiers at Rib Mountain Ski Area

parking lot, open shelter, playground equipment, observation deck adapted to wheelchairs, expanded trail system, new office/visitor entrance station, road repairs and rebuilt park entrance. Total cost of the above would be $500,000 and take at least ten years to complete.

Also located within the state park on a 160-acre tract on the north slope is the Rib Mountain Ski Area (Fig. 6). Cleared of timber and rocks by the Civilian Conservation Corps in the 1930's, it features a 550-foot drop between the elevations of 1,250 feet and 1,800 feet. For many years the ski area was operated by the Wisconsin Conservation Department (now the Department of Natural Resources) who later turned the operation over to a group of local businessmen, who in turn, worked directly under the supervision of the Marathon Civic Corporation. The latter group, a division of the Wausau Area Chamber of Commerce, holds the ski concession and in 1964 contracted with a private concessionaire, the Rib Mountain Ski Corporation, to run the ski area. Between 1965 and 1976, a total of $780,000 in improvements were instituted at the ski area by the concessionaire.

Skiing at Rib Mountain Ski Area offers fifteen slopes which vary from gradual to steep, to suit each skier from beginner to expert. Included are four major slopes that are groomed by an extensive snow-making system which is employed when necessary to compensate for nature's deficiencies. Ownership of facilities at the ski area is a cooperative venture. The state owns the land, the main chalet and eight other buildings, four rope tows and a T-bar while the concessionaire owns two chairlifts (one is

Fig. 6. Rib Mountain Ski Area, from the north.

TABLE 3. Skier Attendance at Rib Mountain Ski Area

1964-65—13,000	1971-72—66,000	1978-79—85,000
1965-66—15,000	1972-73—52,000	1979-80—51,000
1966-67—27,000	1973-74—65,000	1980-81—38,000
1967-68—28,000	1974-75—78,000	1981-82—57,000
1968-69—30,000	1975-76—85,000	1982-83—40,000
1969-70—57,000	1976-77—65,000	
1970-71—61,000	1977-78—95,400	

3,300 feet long), a T-bar and several buildings. Services available at the area include a ski shop, rental shop, repair shop, ticket sales shop, sun porch, cocktail lounge and cafeteria. Drawing heavily on southern Wisconsin and Chicago areas for its clientele, the ski area has suffered at times from the lack of natural snow. Following the record 1977-78 season, the attendance dropped dramatically in the 1979-80, 1980-81 and 1982-83 seasons when the winters were abnormally mild with meager snowfalls. Table 3 indicates the numbers of skiers using the ski area in recent seasons (Oliva 1983, personal communication).

Communications

While Mosinee Hill supports a single corporate radio tower and Hardwood Hill an abandoned fire tower, Rib Mountain is the hub of a complex communications network. As one of the state's highest points of elevation plus having its greatest local relief, it lends itself well to this type of economic activity. A 746-foot television tower, looking like a gigantic toothpick stuck into the "Mountain," dominates the electronic apparatus atop the hill. The tower is jointly owned by WSAW-TV (Channel 7-CBS) and WAOW-TV (Channel 9-ABC), and its highest point serves as the antenna for the two stations. Somewhat lower on the tower is the antenna for WHRM-TV (Channel 20-PBS) which went on the air in October of 1975. Farther down are the antennas for WIFC-FM radio and WHRM-FM radio. Below that are various governmental communications antennas such as NOAA's 24-hour radio and the Wisconsin State Patrol network plus a radio repeater that receives signals from amateur radio operators and rebroadcasts them to a 60 to 70 mile radius. Closer to the bottom of the tower is a series of cone-shaped antennas to receive microwave signals for all incoming television network programming. At the base of the tower are the transmitter facilities for the three television stations which although they appear to be in one building are separate. The transmitter produces about 35,000 watts of power which concentrates into 316,000 watts at the tip of the tower and allows the stations to serve some seventeen counties in northern Wisconsin.

Rib Mountain is the key to communications for Marathon County agencies through a smaller tower that controls radio traffic of the sheriff's department, highway department, park department, office of emergency government and Wausau fire department. Also on top of the "Mountain" are microwave facilities of General Telephone and Electronics and American Telephone and Telegraph that handle long-distance telephone calls for the area. From two rather small buildings at the base of two bulky microwave towers, the GT&E facility can handle about 7,000 conversations and the AT&T equipment upwards of 20,000 conversations at a given moment.

CONCLUSIONS

Having traversed Rib Mountain, Mosinee Hill and Hardwood Hill on foot, the author can attest to their unique character and scenic beauty. Largely due to stony soils and steep slopes, agriculture and forestry have only marginally touched the monadnocks. It is in the fields of recreation, communications and mining that the hills have had the greatest economic impact in the past and, most likely, in the future.

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