Lower Platte South Natural Resources District
Update of Local Hazard Mitigation Plan – Multi-Jurisdictional

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Hazard Mitigation Planning Team

Glenn Johnson, LPSNRD ..... General Manager
Paul Zillig, LPSNRD ..... Assistant Manager
Ed Ubben, LPSNRD ..... Water Resources
Sandy Weyers, Cass County Emergency Management ..... Director
Jared Nelson, City of Lincoln ..... Engineer
Dr. Beth Johnsen, Conestoga Public Schools ..... School Superintendent
Doug A. Ahlberg, Lancaster County Emergency Management ..... Director
Mark Hosking, Lancaster County Emergency Management……...Deputy Director
Bill Kuehn, Lincoln Public Schools..... Director of Security
Sara Hartzell, Lincoln-Lancaster County Planning Department..... Planner
Mark Robertson, University of Nebraska – Lincoln..... Emergency Management
Earl Imler, NEMA** ..... Manager
Shelia Hascall, NEMA**..... State Hazard Mitigation Officer
Mary Baker, NEMA**..... State Hazard Mitigation Officer
Miranda Rogers, NEMA**..... Hazard Mitigation Planning Specialist
*Lalit Jha, JEO..... Project Manager
*Jeffrey Henson, JEO ..... Project Coordinator
*Jeffrey B. Ray, JEO ..... Planning Department Manger
*Alessandra Jerolleman, JEO ..... Senior HMP Planner

*Served as an advisory or consultant role
**Participated for part of the planning process

Table of Contents

Hazard Mitigation Planning Team i
Table of Contents ii
Table of Figures xxi
Table of Tables xxv
List of Acronyms xxxi
Executive Summary 1
Section One: Introduction 1
Hazard Mitigation Planning 1
DMA2000 2
Hazard Mitigation Assistance (HMA) & National Flood Insurance Program (NFIP) 2
Multi-Jurisdictional Approach 3
Plan Financing and Preparation 3
Section Two: Planning Process 5
Summary of Changes 5
Hazard Mitigation Planning Process 5
Plan Update Process 6
Resource Organization 7
planning team 7
Participant Involvement 8
Risk Assessment 9
Hazard Identification 9
Capability Assessment 10
Plan Update 10
Set Planning Goals and Objectives 10
Establish Mitigation Strategies 10
Public Involvement and Outreach 10
Plan Approval and Adoption 11
General Plans, Documents, and Information 11
Plan Implementation and Progress Monitoring 13
Section Three: Community Profile and Capability Assessment 14
Summary of Changes 14
Planning area Geographic Summary 14
Demographics and Assets Summary 15
Population and Housing 15
Rural Water Districts 23
National Historic Registry 24
Federal and/or State Properties 24
Critical Infrastructure and Key Resources (CIKR) 26
Structural Inventory 29
HAZUS-MH 29
Structural Inventory and Valuation Summary 29
Climate Summary 31
Farm Service Agency: SBA Declared Disasters 31
Presidential Disaster Declarations 31
Capability Assessment 32
Regional (Natural Resource District (NRD)) Capability 32
State Capability 33
Federal Assistance 36
Section Four: Risk Assessment 37
Regional Risk Assessment 37

Community Based Risk Assessment 39
Average Annual Damages and Frequency 39
Severe Winter Storms (Severe Winter Storms and Extreme Cold) 41
Hazard Profile 41
Extent 41
Historical Occurrences 44
Average Annual Damages and Frequency 45
Vulnerability Assessment 46
Future Development and Vulnerability 46
Risk Assessment Summary 47
Mitigation Alternatives 47
Tornados 48
Hazard Profile 48
Extent 50
Historical Occurrences 51
Average Annual Damages and Frequency 53
Vulnerability Assessment 53
Future Development and Vulnerability 54
Risk Assessment Summary 54
Mitigation Alternatives 54
High Winds 56
Hazard Profile 56
Extent 56
Historical Occurrences 57
Average Annual Damages and Frequency 57
Vulnerability Assessment 58
Future Development and Vulnerability 58
Risk Assessment Summary 58
Mitigation Alternatives 58
Severe Thunderstorms (Thunderstorm and Lightning) 60
Hazard Profile 60
Extent 61
Historical Occurrences 62
Average Annual Damages and Frequency 63
Vulnerability Assessment 63
Future Development and Vulnerability 64
Risk Assessment Summary 64
Mitigation Alternatives 64
Hail (Hailstorm) 65
Hazard Profile 65
Extent 65
Historical Occurrences 66
Average Annual Damages and Frequency 66
Vulnerability Assessment 67
Future Development and Vulnerability 67
Risk Assessment Summary 67
Mitigation Alternatives 67
Flooding (Riverine and Flash) 69
Hazard Profile 69
Extent 70
NFIP 71
NFIP Repetitive Loss Structures 75

Average Annual Damages and Frequency 75
Historical Occurrences 75
HAZUS 1% Flood Analysis 76
Supplemental Analysis 77
Vulnerability Assessment 77
Future Development and Vulnerability 77
Risk Assessment Summary 77
Mitigation Alternatives 77
Extreme Heat 79
Hazard Profile 79
Extent 79
Historical Occurrences 80
Average Annual Damages and Frequency 81
Vulnerability Assessment 82
Future Development and Vulnerability 82
Risk Assessment Summary 83
Mitigation Alternatives 83
Drought 84
Hazard Profile 84
Extent 85
Historical Occurrences 87
Average Annual Damages and Frequency 88
Vulnerability Assessment 89
Future Development and Vulnerability 90
Risk Assessment Summary 91
Mitigation Alternatives 91
Earthquakes 93
Hazard Profile 93
Extent 93
Historical Occurrences 94
Average Annual Damages and Frequency 97
Vulnerability Assessment 97
Future Development and Vulnerability 97
Risk Assessment Summary 97
Mitigation Alternatives 97
Grass/Wildfires 99
Hazard Profile 99
Historical Occurrences 100
Extent 102
Average Annual Damages and Frequency 103
Vulnerability Assessment 103
Future Development and Vulnerability 104
Risk Assessment Summary 104
Mitigation Alternatives 105
Levee Failure 106
Hazard Profile 106
Extent 106
Historical Occurrences 106
Average Annual Damages and Frequency 106
Vulnerability Assessment 107
Future Development and Vulnerability 109
Risk Assessment Summary 109

Mitigation Alternatives 109
Dam Failure 110
Hazard Profile 110
Historical Occurrences 114
Average Annual Damages and Frequency 115
Vulnerability Assessment 115
Future Development and Vulnerability 115
Risk Assessment Summary 116
Agriculture Diseases 117
Hazard Profile 117
Extent 118
Average Annual Damages and Frequency 122
Vulnerability Assessment 122
Future Development and Vulnerability 122
Risk Assessment Summary 122
Mitigation Alternatives 122
Fixed Site Hazards (Chemical & Radiological) 123
Hazard Profile 123
Extent 123
Historical Occurrences 124
Vulnerability Assessment 125
Future Development and Vulnerability 125
Risk Assessment Summary 125
Transportation Incidents (Chemical, Radiological, and Severe Incidents) 126
Hazard Profile 126
Extent 126
Historical Occurrences 127
Averaged Annual Damages and Vulnerability 130
Vulnerability Assessment 130
Risk Assessment Summary 131
Terrorism 132
Hazard Profile 132
Extent 134
Historical Occurrences 134
Average Annual Damages and Frequency 135
Vulnerability Assessment 135
Future Development and Vulnerability 135
Risk Assessment Summary 135
Civil Disorder 136
Hazard Profile 136
Extent 136
Historical Occurrences 136
Average Annual Damages and Frequency 136
Vulnerability Assessment 136
Future Development and Vulnerability 136
Risk Assessment Summary 137
Urban Fire 138
Hazard Profile 138
Extent 138
Historical Occurrences 138
Average Annual Damages and Frequency 140
Vulnerability Assessment 140

Future Development and Vulnerability 141
Risk Assessment Summary 141
Mitigation Alternatives 141
Hazards Not Profiled 142
Section Five: Mitigation Strategy 143
Summary of Changes 143
Introduction 143
Development of Goals 143
Mitigation Alternatives (Action Items) 144
Participant Mitigation Alternatives 145
Mitigation Alternative Project Matrix 146
Completed Mitigation Efforts 158
Section Six: Plan Implementation and Maintenance 159
Summary of Changes 159
Monitoring, Evaluating, and Updating the Plan 159
Continued Public Involvement 160
Incorporation into Existing Planning Mechanisms 160
The Use of the Safe Growth Audit 160
Section Seven: Participant Sections 161
Summary of Changes 161
Purpose of Participant Sections 161
Participant Section for LPSNRD 162
District Profile 163
History 163
Location 164
Demographics 164
Governance 164
Future Development Trends 165
Structural Inventory and Valuation 166
Risk Assessment 166
Severe Thunderstorms 166
Severe Winter Storms 167
Flooding 167
Chemical Transportation 167
Extreme Heat 168
Capability Assessment 169
Mitigation Actions 169
New or Previously Identified Mitigation Actions 169
Participant Section for Cass County 173
Community Profile 174
History 174
Location 174
Demographics 174
County Governance 175
Future Development Trends 175
Structural Inventory and Valuation 176
Critical Infrastructure/Key Resources 176
Educational Facilities 178
Transportation system 178
Risk Assessment 179
Historical Occurrences 179
Tornados 179

High Winds 179
Severe Thunderstorms....180
Flooding 180
Severe Winter Storms....181
Drought 181
Extreme Heat....181
Capability Assessment....182
Capability Assessment Survey 182
Plan Evaluation 183
Mitigation Actions....184
Completed Mitigation Actions 184
New or Previously Identified Mitigation Actions 185
Participant Section for Avoca 190
Community Profile 191
History....191
Location/Geography....191
Demographics 191
Village Governance....193
Future Development Trends....193
Structural Inventory and Valuation 193
Critical Infrastructure/Key Resources 194
Transportation system 195
Risk Assessment....196
Historical Occurrences 196
Drought 196
Tornados....196
High Winds 196
Extreme Heat....197
Severe Thunderstorms....197
Flooding 197
Severe Winter Storms....198
Grass/Wildfires....198
Capability Assessment....198
Mitigation Actions....200
New or Previously Identified Mitigation Actions 200
Participant Section for Cass County SID #1 202
(Lake WaConDa)....202
Community Profile 203
History....203
Location/Geography....203
Demographics 203
Future Development Trends....203
Structural Inventory and Valuation 203
Critical Facilities 204
Risk Assessment....206
Historical Occurrences 206
Tornados....206
Severe Thunderstorms....206
Levee Failure....206
Flooding 207
High Winds 207
Severe Winter Storms....208

Capability Assessment....208
Mitigation Actions....210
Completed Mitigation Actions....210
New or Previously Identified Mitigation Actions....210
Participant Section for Cass County SID #5....212
(Buccaneer Bay)....212
Community Profile....213
Location/Geography....213
Demographics and Future Development Trends....213
Structural Inventory and Valuation....213
Critical Infrastructure/Key Resources....213
Transportation system....215
Risk Assessment....215
Historical Occurrences....215
Tornados....215
High Winds....215
Severe Thunderstorms....215
Transportation Incidents....215
Capability Assessment....215
Mitigation Actions....217
Completed Mitigation Actions....217
New or Previously Identified Mitigation Actions....218
Participant Section for Cedar Creek....219
Community Profile....220
History....220
Location/Geography....220
Demographics....221
Village Governance....222
Future Development Trends....222
Structural Inventory and Valuation....223
Critical Infrastructure/Key Resources....223
Transportation system....224
Risk Assessment....225
Historical Occurrences....225
Severe Thunderstorms....225
Flooding....225
Transportation Incidents....226
Levee Failure....226
Dam Failure....227
Capability Assessment....227
Mitigation Actions....229
New or Previously Identified Mitigation Actions....229
Participant Section for Eagle....232
Community Profile....233
History....233
Location/Geography....233
Demographics....233
Village Governance....235
Future Development Trends....235
Structural Inventory and Valuation....237
Critical Infrastructure/Key Resources....237
Transportation system....238

Risk Assessment 239
Historical Occurrences 239
Severe Thunderstorms 239
Drought 240
Extreme Heat 240
Tornados 240
High Winds 240
Severe Winter Storms 241
Grass/Wildfires 241
Urban Fire 241
Terrorism 241
Capability Assessment 241
Mitigation Actions 244
Completed Mitigation Actions 244
New or Previously Identified Mitigation Actions 244
Participant Section for Elmwood 246
Community Profile 247
History 247
Location/Geography 247
Demographics 247
Village Governance 249
Future Development Trends 249
Structural Inventory and Valuation 250
Critical Infrastructure/Key Resources 250
Transportation system 251
Educational Facilities 252
Risk Assessment 252
Historical Occurrences 252
Drought 252
Tornados 253
High Winds 253
Earthquake 253
Severe Winter Storms 253
Severe Thunderstorms 253
Extreme Heat 254
Grass/Wildfires 254
Agricultural Plant Disease 254
Flooding 256
Capability Assessment 256
Mitigation Actions 258
New or Previously Identified Mitigation Actions 258
Participant Section for Greenwood 262
Community Profile 263
History 263
Location/Geography 263
Demographics 263
Village Governance 265
Future Development Trends 265
Structural Inventory and Valuation 267
Critical Infrastructure/Key Resources 267
Transportation system 268
Risk Assessment 269

Historical Occurrences 269
Severe Winter Storms....270
Tornados....270
High Winds 270
Severe Thunderstorms....271
Drought 271
Extreme Heat....271
Grass/Wildfires....271
Dam Failure....272
Capability Assessment....272
Plan Evaluation 274
Mitigation Strategies....274
Completed Mitigation Actions 274
New or Previously Identified Mitigation Strategy 274
Participant Section for Louisville 277
Community Profile 278
History....278
Location/Geography....278
Demographics 278
City Governance....280
Future Development Trends....280
Structural Inventory and Valuation 281
Critical Infrastructure/Key Resources 282
Transportation system 283
Educational Facilities 284
Risk Assessment....284
Historical Occurrences 284
Tornados....285
High Winds 285
Severe Winter Storms....285
Severe Thunderstorms....285
Extreme Heat....286
Grass/Wildfires....286
Flooding 286
Chemical Transportation 287
Capability Assessment....288
Mitigation Actions....290
Completed Mitigation Actions 290
New or Previously Identified Mitigation Actions 291
Participant Section for Manley 294
Community Profile 295
History....295
Location/Geography....295
Demographics 295
Village Governance....297
Future Development Trends....297
Structural Inventory and Valuation 298
Critical Infrastructure/Key Resources 299
Transportation System....300
Risk Assessment....301
Historical Occurrences 301
Earthquake....301

Extreme Heat....302
Tornados....302
High Winds....302
Severe Winter Storms....302
Grass/Wildfires....302
Capability Assessment....303
Plan Evaluation....304
Mitigation Actions....305
New Mitigation Actions....305
Participant Section for Murdock....306
Community Profile....307
History....307
Location/Geography....307
Demographics....307
Village Governance....309
Future Development Trends....309
Structural Inventory and Valuation....309
Critical Infrastructure/Key Resources....310
Transportation system....311
Educational Facilities....312
Risk Assessment....312
Historical Occurrences....312
Severe Thunderstorms....312
Extreme Heat....313
Drought....313
Tornados....313
High Winds....313
Severe Winter Storms....313
Capability Assessment....314
Mitigation Actions....315
Completed Mitigation Actions....315
New or Previously Identified Mitigation Actions....316
Participant Section for Murray....318
Community Profile....319
History....319
Location/Geography....319
Demographics....319
City Governance....321
Future Development Trends....321
Structural Inventory and Valuation....321
Critical Infrastructure/Key Resources....322
Transportation system....323
Education Facilities....324
Risk Assessment....325
Historical Occurrences....325
Severe Thunderstorms....325
Severe Winter Storms....326
Extreme Heat....326
Tornados....326
High Winds....326
Earthquake....327
Flooding....327

Grass/Wildfires....327
Terrorism....327
Capability Assessment....327
Mitigation Actions....331
New or Previously Identified Mitigation Actions....331
Participant Section for Plattsmouth....333
Community Profile....334
History....334
Location/Geography....334
Demographics....334
City Governance....336
Future Development Trends....336
Structural Inventory and Valuation....338
Critical Infrastructure/Key Resources....338
Transportation system....341
Risk Assessment....341
Historical Occurrences....341
Flooding....342
Extreme Heat....342
Grass/Wildfires....342
Drought....343
Tornados....343
High Winds....343
Chemical Transportation....343
Capability Assessment....344
Mitigation Actions....346
Completed Mitigation Actions....346
New or Previously Identified Mitigation Actions....347
Participant Section for South Bend....349
Community Profile....350
History....350
Location/Geography....350
Demographics....350
Future Development Trends....352
Village Governance....352
Structural Inventory and Valuation....353
Critical Infrastructure/Key Resources....353
Transportation system....354
Risk Assessment....355
Historical Occurrences....355
Tornados....355
High Winds....355
Drought....355
Severe Thunderstorms....356
Severe Winter Storms....356
Flooding....356
Capability Assessment....357
Mitigation Actions....358
New or Previously Identified Mitigation Actions....358
Participant Section for Union....361
Community Profile....362
History....362

Location/Geography 362
Demographics 362
Village Governance 364
Future Development Trends 364
Structural Inventory and Valuation 365
Critical Infrastructure/Key Resources 365
Transportation system 367
Risk Assessment 368
Historical Occurrence 368
Tornados 368
High Winds 368
Severe Winter Storms 369
Severe Thunderstorms 369
Flooding 369
Drought 370
Terrorism 370
Capability Assessment 370
Mitigation Actions 372
Completed Mitigation Actions 372
New or Ongoing Mitigation Actions 373
Participant Section for Weeping Water 374
Community Profile 375
History 375
Location/Geography 375
Demographics 375
Future Development Trends 377
Structural Inventory and Valuation 378
Critical Infrastructure/Key Resources 379
Transportation system 382
Educational Facilities 382
Risk Assessment 382
Historical Occurrences 382
Severe Thunderstorms 383
Drought 383
Severe Winter Storms 384
Extreme Heat 384
Tornados 384
High Winds 384
Flooding 384
Transportation 385
Capability Assessment 386
Mitigation Actions 390
Completed Mitigation Actions 390
New or Previously Identified Mitigation Actions 390
Participant Section for Lancaster County 392
Community Profile 393
History 393
Location/Geography 393
Demographics 394
County Governance 395
Future Development Trends 395
Structural Inventory and Valuation 398

Critical Facilities 398
Rural Water District #1 399
Transportation system 400
Schools 401
Risk Assessment 401
Historical Occurrences 401
Tornados 401
High Winds 402
Severe Thunderstorms 402
Severe Winter Storms 402
Flooding 403
Earthquake 403
Urban Fire 403
Terrorism 404
Chemical Transportation 405
Capability Assessment 407
Plan Evaluation 409
Mitigation Actions 410
Completed Mitigation Actions 410
New or Previously Identified Mitigation Actions 411
Participant Section for Bennet 415
Community Profile 416
History 416
Location/Geography 416
Demographics 416
City Governance 418
Future Development Trends 418
Structural Inventory and Valuation 420
Critical Infrastructure/Key Resources 420
Transportation system 421
Educational Facilities 422
Risk Assessment 422
Historical Occurrences 422
Tornados 423
High Winds 423
Severe Winter Storms 423
Drought 424
Severe Thunderstorms 424
Terrorism 424
Transportation 424
Capability Assessment 425
Mitigation Actions 427
Completed Mitigation Actions 427
New or Previously Identified Mitigation Actions 428
Participant Section for Davey 431
Community Profile 432
History 432
Location/Geography 432
Demographics 432
Village Governance 434
Future Development Trends 434
Structural Inventory and Valuation 434

Critical Infrastructure/Key Resources 435
Transportation system 436
Risk Assessment 437
Historical Occurrences 437
Extreme Heat 437
Severe Thunderstorms 437
Severe Winter Storms 438
Tornados 438
High Winds 438
Drought 438
Capability Assessment 438
Mitigation Strategy 440
New or Previously Identified Mitigation Actions 440
Participant Section for Denton 442
Community Profile 443
History 443
Location/Geography 443
Demographics 443
City Governance 445
Future Development Trends 445
Structural Inventory and Valuation 445
Critical Infrastructure/Key Resources 446
Transportation system 447
Risk Assessment 448
Historical Occurrences 448
Tornados 448
High Winds 448
Drought 449
Extreme Heat 449
Severe Winter Storms 449
Capability Assessment 449
Mitigation Strategy 451
New or Ongoing Mitigation Actions 452
Participant Section for Firth 454
Community Profile 455
History 455
Location/Geography 455
Demographics 455
Village Governance 457
Future Development Trends 457
Structural Inventory and Valuation 457
Critical Infrastructure/Key Resources 458
Transportation system 460
Risk Assessment 460
Historical Occurrences 460
Severe Thunderstorms 460
Severe Winter Storms 461
Drought 461
Extreme Heat 461
Tornados 461
High Winds 461
Chemical Transportation 461

Capability Assessment....462
Mitigation Actions....463
Completed Mitigation Actions....463
New or Previously Identified Mitigation Actions....464
Participant Section for Hallam....466
Community Profile....467
History....467
Location/Geography....467
Demographics....468
Village Governance....469
Future Development Trends....469
Structural Inventory and Valuation....470
Critical Infrastructure/Key Resources....471
Transportation system....473
Risk Assessment....473
Historical Occurrences....473
Tornados....473
High Winds....474
Severe Thunderstorms....474
Severe Winter Storms....474
Drought....475
Extreme Heat....475
Grass/Wildfires....475
Capability Assessment....475
Mitigation Actions....477
Completed Mitigation Actions....477
New or Previously Identified Mitigation Actions....478
Participant Section for Hickman....480
Community Profile....481
History....481
Location/Geography....481
Demographics....481
Future Development Trends....483
Critical Infrastructure/Key Resources....485
Transportation system....487
Risk Assessment....487
Historical Occurrences....487
Tornados....487
High Winds....488
Severe Thunderstorms....488
Drought....488
Severe Winter Storms....488
Flooding....489
Extreme Heat....489
Grass/Wildfires....490
Dam Failure....490
Capability Assessment....490
Plan Evaluation....492
Mitigation Actions....493
Completed Mitigation Actions....493
New or Previously Identified Mitigation Actions....493
Participant Section for Lincoln....496

Community Profile 497
History 497
Location/Geography 497
Demographics 500
City Governance 502
Future Development Trends 502
Structural Inventory and Valuation 505
Critical Infrastructure/Key Resource 505
Transportation system 507
Risk Assessment 508
Historical Occurrences 508
Tornados 508
High Winds 509
Drought 509
Severe Winter Storms 509
Severe Thunderstorms 510
Extreme Heat 510
Flooding 510
Transportation 513
Chemical Transportation 513
Levee Failure 514
Capability Assessment 515
Capability Assessment Survey 515
Plan Evaluation 517
Mitigation Strategy 518
New or Previously Identified Mitigation Actions 519
Participant Section for Malcolm 531
Community Profile 532
History 532
Location/Geography 532
Demographics 532
Village Governance 534
Future Development Trends 534
Structural Inventory and Valuation 535
Critical Infrastructure/Key Resources 536
Transportation system 537
Educational Facilities 538
Risk Assessment 538
Historical Occurrences 538
Drought 538
Extreme Heat 539
Earthquake 539
Capability Assessment 539
Mitigation Strategy 541
Completed Mitigation Actions 541
New or Previously Identified Mitigation Actions 541
Participant Section for Panama 544
Community Profile 545
History 545
Location 545
Demographics 545
Village Governance 547

Future Development Trends 547
Structural Inventory and Valuation 548
Critical Infrastructure/Key Resources 548
Transportation system 551
Risk Assessment 551
Historical Occurrences 551
Severe Thunderstorms 551
Tornados 552
High Winds 552
Drought 552
Flooding 552
Capability Assessment 552
Plan Evaluation 554
Mitigation Actions 554
Completed Mitigation Actions 554
New or Previously Identified Mitigation Actions 554
Participant Section for Roca 559
Community Profile 560
History 560
Location/Geography 560
Demographics 560
Future Development Trends 562
Village Governance 562
Structural Inventory and Valuation 562
Critical Infrastructure/Key Resources 563
Transportation system 564
Risk Assessment 565
Historical Occurrences 565
Flooding 565
Tornados 566
High Winds 566
Capability Assessment 566
Mitigation Actions 567
New or Previously Identified Mitigation Actions 567
Participant Section for Waverly 569
Community Profile 570
History 570
Location/Geography 570
Demographics 570
City Governance 572
Future Development Trends 572
Structural Inventory and Valuation 575
Critical Infrastructure/Key Resources 575
Transportation system 577
Educational Facilities 577
Risk Assessment 577
Historical Occurrences 577
Flooding 578
Tornados 578
High Winds 579
Grass/Wildfires 579
Capability Assessment 579

Mitigation Actions 581
Completed Mitigation Actions 581
New or Previously Identified Mitigation Actions 581
Participant Section for Ashland 585
Community Profile 586
History 586
Location/Geography 586
Demographics 586
City Governance 588
Future Development Trends 588
Structural Inventory and Valuation 589
Critical Infrastructure/Key Resources 590
Transportation system 593
Educational Facilities 594
Risk Assessment 594
Historical Occurrences 594
Severe Thunderstorms 595
Tornados 596
High Winds 596
Severe Winter Storms 596
Capability Assessment 596
Mitigation Actions 598
Completed Mitigation Actions 598
New or Previously Identified Mitigation Actions 599
Participant Section for Brainard 602
Community Profile 603
History 603
Location/Geography 603
Demographics 603
City Governance 605
Future Development Trends 605
Structural Inventory and Valuation 606
Critical Infrastructure/Key Resources 607
Transportation system 608
Educational Facilities 609
Risk Assessment 609
Historical Occurrences 609
Drought 609
Extreme Heat 610
Severe Winter Storms 610
Grass/Wildfires 610
Severe Thunderstorms 611
Tornados 611
High Winds 611
Urban Fire 611
Chemical Transportation 612
Capability Assessment 612
Mitigation Actions 614
New or Previously Identified Mitigation Actions 614
Participant Section for Ceresco 616
Community Profile 617
History 617

Location/Geography....617
Demographics....617
Village Governance....619
Future Development Trends....619
Structural Inventory and Valuation....621
Critical Infrastructure/Key Resources....621
Transportation system....623
Risk Assessment....623
Historical Occurrences....623
Tornados....624
High Winds....624
Severe Thunderstorms....624
Extreme Heat....624
Drought....625
Flooding....625
Transportation....625
Capability Assessment....625
Capability Assessment Survey....626
Mitigation Actions....628
Completed Mitigation Actions....628
New or Previously Identified Mitigation Actions....628
Participant Section for Valparaiso....630
Community Profile....631
History....631
Location/Geography....631
Demographics....631
Future Development Trends....633
Structural Inventory and Valuation....633
Critical Infrastructure/Key Resources....634
Transportation system....635
Risk Assessment....636
Historical Occurrences....636
Tornados....636
High Winds....636
Drought....636
Severe Thunderstorms....637
Chemical Transportation....637
Flooding....638
Capability Assessment....639
Capability Assessment Survey....639
Mitigation Strategy....641
Completed Mitigation Actions....641
New or Previously Identified Mitigation Actions....641
Appendix A – Adoption Letters and Resolutions....645
Appendix B – Documents of Public Involvement....646
Appendix C – Public Meeting Materials and Worksheets....662
Appendix D – Worksheets to Assist Community in Review and Updates....673
Appendix E – Stakeholder Groups....682
Hazard Mitigation Project Funding Guidebook....686

Table of Figures

Figure 1: Participating Jurisdictions 1
Figure 2: Plan Update Timeline 6
Figure 3: Location of LPSNRD 14
Figure 4: LPSNRD Population by Gender and Age 20
Figure 5: Age of Structures 22
Figure 6: University of Nebraska City Campus 25
Figure 7: University of Nebraska City Campus Floodplain 25
Figure 8: University of Nebraska East Campus 26
Figure 9: Government Properties inside the 100-Year Floodplain 28
Figure 10: Organizational Components of Nebraska's CARC 35
Figure 11: SPIA Index 42
Figure 12: NOAA Wind-chill Chart 43
Figure 13: LPSNRD Average and Extreme Low Temperatures 43
Figure 14: Monthly Trend for Severe Winter Storms 44
Figure 15: LPSNRD Monthly Average Snowfall 44
Figure 16: Monthly Tornado Averages 48
Figure 17: Tornado Time of Occurrence 49
Figure 18: Tornado Activity in the United States 49
Figure 19: Monthly Trend for Tornados 52
Figure 20: Wind Zones in the United States 56
Figure 21: High Wind Events by Month 57
Figure 22: Monthly Trend for Severe Thunderstorms 60
Figure 23: Annual Average Number of Thunderstorm Events 61
Figure 24: Hail Events by Size 1996 - 2013 66
Figure 25: LPSNRD 1% Annual Floodplain Coverage 70
Figure 26: LPSNRD Average Precipitation 71
Figure 27: Monthly Trend for Floods in the LPSNRD (1996-2013) 71
Figure 28: NOAA Heat Index 79
Figure 29: LPSNRD Average and Extreme High Temperatures 80
Figure 30: Monthly Trend for Extreme Heat in LPSNRD (1996-2013) 80
Figure 31: Drought Condition in Nebraska and Lower Platte South (Jan 15, 2013) 84
Figure 32: Sequence and Impacts of Drought Types 85
Figure 33: Palmer Drought SI 86
Figure 34: Historical Drought Intensity (Percent Area) Nebraska 87
Figure 35: USDA Secretarial Disaster Designations 88
Figure 36: U.S. Seasonal Drought Outlook 91
Figure 37: Fault Lines in Nebraska 93
Figure 38: Nebrasaka Earthquakes 95
Figure 39: Nebrasaka Earthquakes 96
Figure 40: Nebraska Seismic Hazard Map 97
Figure 41: Number of Wildfires by Cause in Nebraska 2004-2010 99
Figure 42: Fires by Cause in LPSNRD (2000-2012) 100
Figure 43: Fires per Year in LPSNRD 101
Figure 44: Wildfires Greater Than 100 Acres in Nebraska 1980-2007 102
Figure 45: Acres Burned by Cause in Nebraska 2004-2010 103
Figure 46: Wildfire Risk Potential Map, USDA Forest Service 2013 104
Figure 47: LPSNRD Levees 108
Figure 48: Location of High Hazard Dams 112
Figure 49: Land Use in the LPSNRD 118
Figure 50: LPSNRD Transportation Routes 126

Figure 51: Lancaster and Cass Counties Population, 1930-2010 164
Figure 52: LPSNRD Map 165
Figure 53: LPSNRD Major Transportation Routes 168
Figure 54: Cass County, Nebraska Population 1930-2010 175
Figure 55: Topographic Map 191
Figure 56: Population 1930-2010 192
Figure 57: Housing Units by Year Built 193
Figure 58: Critical Facilities Map 195
Figure 59: Lake WaConDa Topographic Map....203
Figure 60: Lake WaConDa Critical Facilities....205
Figure 61: Topographic Map 213
Figure 62: Critical Facilities Map 214
Figure 63: Topographic Map 220
Figure 64: Population 1970 - 2010 221
Figure 65: Housing Units by Year Built 222
Figure 66: Critical Facilities Map 224
Figure 67: Topographic Map 233
Figure 68: Population 1930 - 2010 234
Figure 69: Housing Units by Year Built: 235
Figure 70: Future Land Use Map 236
Figure 71: Critical Facility Map....238
Figure 72: Elmwood Topographic Map....247
Figure 73: Elmwood Population 1930 - 2010....248
Figure 74: Housing Age....249
Figure 75: Future Development 250
Figure 76: Critical Facilities Map 251
Figure 77: Topographic Map 263
Figure 78: Population 1930 - 2010 264
Figure 79: Housing Units by Year Built 265
Figure 80: Future Land Use Map....266
Figure 81: Critical Facilities Map 268
Figure 82: Topographic Map 278
Figure 83: Population 1930-2010 279
Figure 84: Housing Units by Year Built 280
Figure 85: Future Development 281
Figure 86: Critical Facilities Map 283
Figure 87: Transportation Risk Map....288
Figure 88: Topographic Map 295
Figure 89: Population 1960-2010 296
Figure 90: Housing Units by Year Built 297
Figure 91: Future Land Use Map....298
Figure 92: Critical Facilities Map 300
Figure 93: Topographic Map 307
Figure 94: Population 1930 - 2010 308
Figure 95: Housing Units by Year Built 309
Figure 96: Critical Facilities Map 311
Figure 97: Topographic Map 319
Figure 98: Population 1940 - 2010 320
Figure 99: Housing Units by Year Built 321
Figure 100: Critical Facilities Map 323
Figure 101: Conestoga Public School District....324
Figure 102: Topographic Map 334

Figure 103: Population 1930-2010 335
Figure 104: Housing Units by Year Built 336
Figure 105: Future Development Map 337
Figure 106: Critical Facilities Map 340
Figure 107: Transportation Risk Map 344
Figure 108: Topographic Map 350
Figure 109: Population 1930 - 2010 351
Figure 110: Housing Units by Year Built 352
Figure 111: Future Land Use Map 353
Figure 112: Critical Facilities Map 354
Figure 113: Topographic Map 362
Figure 114: Population 1930 - 2010 363
Figure 115: Future Land Use Map 365
Figure 116: Critical Facilities Map 367
Figure 117: Topographic Map 375
Figure 118: Population 1930-2010 376
Figure 119: Housing Units by Year Built 377
Figure 120: Future Land Use Map (1999) 378
Figure 121: Critical Facilities Map 381
Figure 122: Transportation Buffer 386
Figure 123: Location of Lancaster County 393
Figure 124: Population 1930-2010 394
Figure 125: Future Development 396
Figure 126: Future Land Use 397
Figure 127: Transportation System 400
Figure 128: Transportation Corridors 406
Figure 129: Truck Routes 407
Figure 130: Topographic Map 416
Figure 131: Population 1930-2010 417
Figure 132: Housing Units by Year Built 418
Figure 133: Future Land Use Map 419
Figure 134: Critical Facilities Map 421
Figure 135: Transportation Risk 425
Figure 136: Topographic Map 432
Figure 137: Population 1930-2010 433
Figure 138: Housing Units by Year Built 434
Figure 139: Critical Facilities Map 436
Figure 140: Topographic Map 443
Figure 141: Population 1930-2010 444
Figure 142: Housing Unit by Year Built 445
Figure 143: Critical Facilities Map 447
Figure 144: Topographic Map 455
Figure 145: Population 1930-2010 456
Figure 146: Housing Unit by Year Built 457
Figure 147: Critical Facilities Map 459
Figure 148: Topographic Map 467
Figure 149: Population 1930-2010 468
Figure 150: Housing Units by Year Built 469
Figure 151: Future Land Use 470
Figure 152: Critical Facilities Map 472
Figure 153: Topographic Map 481
Figure 154: Population 1930 - 2010 482

Figure 155: Housing Units by Year Built 483
Figure 156: Hickman Future Development Map 484
Figure 157: Critical Facilities Map 486
Figure 158: Watershed Map....498
Figure 159: Topographic Map 499
Figure 160: Population 1930-2010 500
Figure 161: Housing Units by Year Built 501
Figure 162: Priority Growth....503
Figure 163: Future Land Use 504
Figure 164: Critical Facilities Map 507
Figure 165: Truck Routes 513
Figure 166: Transportation Risk 514
Figure 167: Levee Protected Areas....515
Figure 168: Topographic Map 532
Figure 169: Population 1930-2010 533
Figure 170: Future Development 535
Figure 171: Critical Facilities Map 537
Figure 172: Topographic Map 545
Figure 173: Population 1930-2010 546
Figure 174: Housing Unit by Year Built....547
Figure 175: Future Land-Use Map....548
Figure 176: Critical Facilities Map 550
Figure 177: Topographic Map 560
Figure 178: Population 1930-2010 561
Figure 179: Housing Age....562
Figure 180: Critical Facilities Map 564
Figure 181: Topographic Map 570
Figure 182: Population 1930-2010 571
Figure 183: Housing Units by Year Built 572
Figure 184: Future Land Use Map....573
Figure 185: Critical Facility Map....576
Figure 186: Ashland Topographic Map 586
Figure 187: Ashland, Nebraska Population 1930-2010 587
Figure 188: Housing Units by Year Built 588
Figure 189: Future Development Areas....589
Figure 190: Locations of Critical Facilities 593
Figure 191: Brainard Topographic Map 603
Figure 192: Population 1930-2010 604
Figure 193: Housing Unit by Year Built....605
Figure 194: Future Land Use Map....606
Figure 195: Critical Facilities Map 608
Figure 196: Ceresco Topographic Map 617
Figure 197: Ceresco, NE Population 1930 - 2010 618
Figure 198: Housing Unit by Year Built....619
Figure 199: Future Land-use Map 620
Figure 200: Critical Facilities 622
Figure 201: Topographic Map 631
Figure 202: Population 1930 -2010 632
Figure 203: Housing Units by Year Built: 633
Figure 204: Critical Facilities Map 635
Figure 205: Transportation Risk Map....638

Table of Tables

Table 1: Hazard Mitigation Planning Team....7
Table 2: Public Notification - 'Hazard Identification' Meetings....8
Table 3: General Plans, Documents, and Information....11
Table 4: Population Trends 2000-2010....15
Table 5: Population by Age....17
Table 6: Housing Occupancy and Tenure....21
Table 7: Selected Demographic Characteristics, Cass County....22
Table 8: Selected Demographic Characteristics, Lancaster County....23
Table 9: Growth Trends in the Rural Water Districts....24
Table 10: National Historic Registry....24
Table 11: Critical Facilities....26
Table 12: LPSNRD Critical Facilities Summary....27
Table 13: Structural Inventory and Valuation Summary....30
Table 14: Farm Service Agency SBA Disasters....31
Table 15: Presidential Disaster Declarations in the Last Decade....31
Table 16: Other Key Agencies in the State of Nebraska....35
Table 17: Major Federal Assistant Agencies....36
Table 18: Regional Risk Assessment....38
Table 19: Hazard Loss Estimation....40
Table 20: Enhanced Fujita Scale....50
Table 21: Enhanced F Scale Damage Indicators....50
Table 22: Beaufort Wind Force Rankings....56
Table 23: TORRO Hailstone Scale....65
Table 24: Flood Definitions....70
Table 25: NFIP Status - December 2012....72
Table 26: NFIP Policies - December 2012....73
Table 27: Repetitive Loss Properties....75
Table 28: Building Damage by Percent Damages in Thousands of Square Feet....76
Table 29: Building Damage by Occupancy in Thousands of Square Feet....76
Table 30: Building Damage by Percent Damages in Numbers of Buildings....76
Table 31: Building Damage by Occupancy Category in Numbers of Buildings....76
Table 32: Direct Economic Losses from Buildings in Thousands of Dollars....76
Table 33: Shelter Requirements....77
Table 34: Loss of Electricity - Assumed Damage by Jurisdiction....81
Table 35: Palmer Classifications....86
Table 38: U.S. Drought Monitor Classification....86
Table 37: Number of Reported Drought Impacts by Sector (January 2003 - October 2013)....88
Table 38: Classification of Drought-Related Impacts....89
Table 39: Richter Scale....93
Table 40: Modified Mercalli Intensity Scale....94
Table 41: Levee Safety Action Classification....106
Table 42: Dams Summary for the LPSNRD....111
Table 43: High Hazard Dams in the LPSNRD....113
Table 44: Dam Classification....116
Table 45: Livestock Inventory Cass & Lancaster Counties....120
Table 46: Animal Diseases Recorded by the NDA....120
Table 47: Crop Diseases Recorded by the NDA....120
Table 48: Land in and Value of Farms in Cass and Lancaster County....121
Table 49: Crops Totals Cass & Lancaster County....121

Table 50: Common Crop Diseases in Nebraska by Crop Types....121
Table 51: Classes of Hazardous Material 124
Table 52: Number of Fixed Site Chemical Spills 124
Table 53: Transportation Incidents Involving Hazardous Materials....127
Table 54: Chemical Release Loss Estimation....130
Table 55: Terrorist Events 135
Table 56: Calls Responded to by Fire Departments within the Planning Area....138
Table 57: Death Rates Resulting from Fire in Nebraska 141
Table 58: Mitigation Alternative Projects....146
Table 59: Mitigation Alternatives selected by each community....150
Table 60: Structural Inventory for LPSNRD 166
Table 61: Structural Inventory - Floodplain 166
Table 64: LPSNRD Capability Assessment....169
Table 63: Structural Inventory and Valuation Summary 176
Table 64: Structural Inventory – Floodplain....176
Table 65: Cass County Key Facilities....177
Table 66: NCDC Severe Weather Events 179
Table 67: NCDC Severe Weather Events - No Damages 179
Table 68: Cass County Capability Assessment....182
Table 69: Cass County Safe Growth Audit....184
Table 70: Population by Age 192
Table 71: Housing and Income 192
Table 72: Avoca Structural Inventory....194
Table 73: Avoca Critical Facilities 194
Table 78: NCDC Severe Weather Events 196
Table 75: Avoca Capability Assessment 199
Table 76: Lake WaConDa Capabilities Assessment Survey 208
Table 81: Critical Facilities....213
Table 78: Capability Assessment....216
Table 79: Population by Age 221
Table 80: Housing and Income 221
Table 81: Structural Inventory 223
Table 82: Critical Facilities....223
Table 83: NCDC Severe Weather Events 225
Table 84: Capability Assessment....228
Table 85: Population by Age 234
Table 86: Housing and Income 234
Table 87: Structural Inventory 237
Table 88: Critical Facilities....237
Table 89: NCDC Severe Weather Events 239
Table 90: Capability Assessment....242
Table 91: Population by Age 248
Table 92: Housing and Income 248
Table 93: Structural Inventory and Valuation Summary 250
Table 94: Elmwood Critical Facilities 251
Table 95: NCDC Severe Weather Events 252
Table 102: Common Crop Diseases....255
Table 97: Capability Assessment Survey....257
Table 98: Population by Age 264
Table 99: Housing and Income 264
Table 100: Structural Inventory 267
Table 101: Critical Facilities....267

Table 102: NCDC Severe Weather Events 269
Table 103: Capability Assessment Survey....272
Table 104: Population by Age 279
Table 105: Housing and Income 279
Table 106: Structural Inventory 281
Table 107: List of Critical Facilities 282
Table 108: NCDC Severe Weather Events 284
Table 109: Capability Assessment 289
Table 110: Population by Age 296
Table 111: Housing and Income 296
Table 112: Structural Inventory 299
Table 113: Critical Facilities....299
Table 114: NCDC Severe Weather Events 301
Table 115: Capability Assessment....303
Table 116: Population by Age 308
Table 117: Housing and Income 308
Table 118: Structural Inventory 310
Table 119: Critical Facilities....310
Table 120: NCDC Severe Weather Events 312
Table 121: Capability Assessment 314
Table 122: Population by Age 320
Table 123: Housing and Income 320
Table 124: Structural Inventory 322
Table 125: Critical Facilities....322
Table 126: NCDC Severe Weather Events 325
Table 127: Capability Assessment....328
Table 128: Safe Growth Audit Findings 329
Table 129: Capability Assessment- Conestoga Public Schools....330
Table 130: Population by Age 335
Table 131: Housing and Income 335
Table 132: Structural Inventory 338
Table 133: Critical Facilities....338
Table 134: NCDC Severe Weather Events 341
Table 135: Capability Assessment....345
Table 136: Population by Age 351
Table 137: Housing and Income 351
Table 138: Structural Inventory 353
Table 139: Critical Facilities....354
Table 140: NCDC Severe Weather Events 355
Table 141: Structural Inventory - Floodplain 356
Table 142: Capability Assessment....357
Table 143: Population by Age 363
Table 144: Housing and Income 363
Table 145: Housing Units by Year Built 364
Table 146: Structural Inventory 365
Table 147: Critical Facilities....366
Table 148: NCDC Severe Weather Events 368
Table 149: Structural Inventory - Floodplain 370
Table 150: Capability Assessment....371
Table 151: Population by Age 376
Table 152: Housing and Income 376
Table 153: Structural Inventory 379

Table 154: Critical Facilities....379
Table 155: NCDC Severe Weather Events....382
Table 156: Structural Inventory - Floodplain....385
Table 157: Capability Assessment....387
Table 158: Capability Assessment - Weeping Water Public Schools....388
Table 159: Structural Inventory....398
Table 160: Structural Inventory - Floodplain....398
Table 161: Emergency Support Functions....398
Table 162: NCDC Severe Weather Events....401
Table 163: Calls Responded to by Fire Departments in Lancaster County....404
Table 164: Terrorist Events Reported in Lancaster County....405
Table 165: Capability Assessment....408
Table 190: Safe Growth Audit....410
Table 167: Population by Age....417
Table 168: Housing and Income....417
Table 169: Structural Inventory....420
Table 170: Critical Facilities....420
Table 171: NCDC Severe Weather Events....422
Table 172: Capability Assessment....426
Table 173: Population by Age....433
Table 174: Housing and Income....433
Table 175: Structural Inventory....435
Table 176: Critical Facilities....435
Table 177: NCDC Severe Weather Events....437
Table 178: Capability Assessment....439
Table 179: Population by Age....444
Table 180: Housing and Income....444
Table 181: Structural Inventory....446
Table 182: Critical Facilities....446
Table 183: NCDC Severe Weather Events....448
Table 184: Capability Assessment....450
Table 185: Population by Age....456
Table 186: Housing and Income....456
Table 187: Structural Inventory....458
Table 188: Critical Facilities....458
Table 189: NCDC Severe Weather Events....460
Table 190: Capability Assessment....462
Table 191: Population by Age....468
Table 192: Housing and Income....469
Table 193: Structural Inventory....470
Table 194: Critical Facilities....471
Table 195: NCDC Severe Weather Events....473
Table 196: Capability Assessment....476
Table 197: Population by Age....482
Table 198: Housing and Income....482
Table 199: Structural Inventory....485
Table 200: Critical Facilities....485
Table 201: NCDC Severe Weather Events....487
Table 202: Structural Inventory – Floodplain....489
Table 203: Capability Assessment....491
Table 204: Safe Growth Audit Evaluation Findings....492
Table 205: Population by Age....501

Table 206: Housing and Income 501
Table 207: Structural Inventory 505
Table 208: Critical Facilities 505
Table 209: Critical Facilities in 1% annual Floodplain 505
Table 210: NCDC Severe Weather Events 508
Table 263: Structural Inventory - Floodplain 512
Table 212: Capability Assessment 516
Table 213: Safe Growth Audit 517
Table 214: Population by Age 533
Table 215: Housing Statistics 533
Table 216: Housing Units by Year Built 534
Table 217: Structural Inventory 535
Table 218: Critical Facilities 536
Table 219: NCDC Severe Weather Events 538
Table 220: Capability Assessment 539
Table 221: Population by Age 546
Table 222: Housing and Income 546
Table 223: Structural Inventory 548
Table 224: Critical Facilities 549
Table 225: NCDC Severe Weather Events 551
Table 226: Capability Assessment 553
Table 227: Population by Age 561
Table 228: Housing and Income 561
Table 229: Structural Inventory 563
Table 230: Critical Facilities 563
Table 231: NCDC Severe Weather Events 565
Table 232: Structural Inventory 565
Table 233: Capability Assessment 566
Table 234: Population by Age 571
Table 235: Housing and Income 571
Table 236: Structural Inventory 575
Table 237: Critical Facilities 575
Table 238: NCDC Severe Weather Events 577
Table 297: Structural Inventory – Floodplain 578
Table 240: Capability Assessment 580
Table 241: Population by Age 587
Table 242: Housing and Income 587
Table 243: Structural Inventory and Valuation Summary 590
Table 304: Critical Facilities 590
Table 245: NCDC Severe Weather Events 594
Table 246: Capability Assessment Survey Information 597
Table 247: Population by Age 604
Table 248: Housing and Income 604
Table 249: Structural Inventory and Valuation Summary 607
Table 250: List of Critical Facilities 607
Table 251: NCDC Severe Weather Events 609
Table 252: Capability Assessment Survey 612
Table 253: Population Distribution 618
Table 254: Income and Housing 618
Table 255: Structural Inventory 621
Table 256: List of Critical Facilities 621
Table 257: NCDC Severe Weather Events 623

Table 258: Capability Assessment Survey....626
Table 259: Population by Age....632
Table 260: Housing and Income....632
Table 261: Structural Inventory....633
Table 262: Critical Facilities....634
Table 263: NCDC Severe Weather Events....636
Table 264: Capability Assessment....640

List of Acronyms

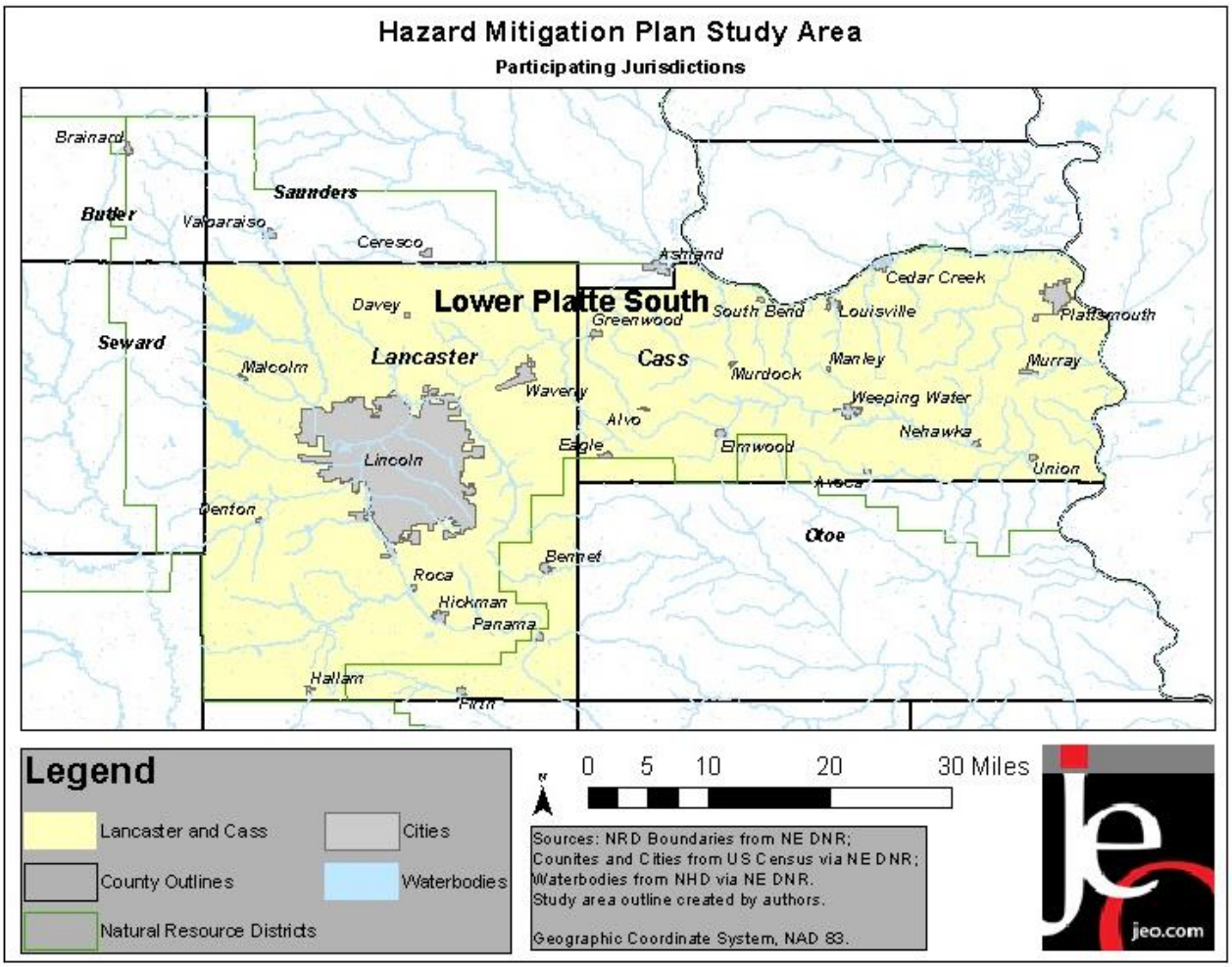
APA – American Planning Association
BCA – Benefit Cost Analysis
CARC – Nebraska Climate Assessment and Response Committee
CF – Critical Facility
CFR – Code of Federal Regulations
CIKR – Critical Infrastructure and Key Resources
CRS – Community Rating System
CTP - Cooperating Technical Partners Program
CWS – Chronic Wasting Disease
DHS – Department of Homeland Security
DMA2000 – Disaster Mitigation Act of 2000
EAS – Emergency Alert System
EHD – Epizootic Hemorrhagic Disease
ELAP – Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program
EMS – Emergency Medical Services
EOC – Emergency Operation Center
ERC – Emergency Response Committee
ESF – Emergency Support Functions
FBI – Federal Bureau of Investigation
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FMA – Flood Mitigation Assistance Program
GIS - Geographic Information Systems
GTFDR – Governor's Task Force for Disaster Recovery
HAZUS-MH – Hazards United States-Multi Hazard
HMA – Hazard Mitigation Assistance
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
HSAS – Homeland Security Advisory System
HUD - Department of Housing and Urban Development
IFR – Interim Final Rule
JEO – JEO Consulting Group, Inc.
LFD – Livestock Forage Disaster Assistance Program
LIP – Livestock Indemnity Program
LPSNRD – Lower Platte South Natural Resource District
NCDC – National Climatic Data Center
NDA – Nebraska Department of Agriculture
NDEQ – Nebraska Department of Environmental Quality
NDMC – National Drought Mitigation Center
NDNR – Nebraska Department of Natural Resources
NEMA - Nebraska Emergency Management Agency
NFIP – National Flood Insurance Program
NFIRS – National Fire Incident Reporting System
NIPP – National Infrastructure Protection Plan
NRD – Natural Resource District
NTAS – National Terrorism Advisory System
NWS – National Weather Service
PHMSA – Pipeline Hazardous Materials and Safety Administration
PDM – Pre-Disaster Mitigation Program
PDSI - Palmer Drought Severity Index

RAC – Risk Assessment Committee
SBA – Small Business Administration
SFHA – Special Flood Hazard Area
SPIA - Sperry-Piltz Ice Accumulation Index
SSA – Sector Specific Agency
SURE – Supplemental Revenue Assistance Payments
TAP – Tree Assistance Program
TRI – Toxics Release Inventory Program
USDA – United States Department of Agriculture
USGS - United States Geological Survey
VS – Vesticular Stomatitis
WAOC – Water Availability and Outlook Committee
WUI – Wildland Urban Interface

Executive Summary

In April, 2012, the Lower Platte South Natural Resources District (LPSNRD) decided to update their hazard mitigation plan (HMP) in compliance with the 5-year update requirement established by the Disaster Mitigation Act of 2000 (DMA2000). This updated plan was prepared in order to reduce the participating communities' vulnerability to natural hazards and maintain their eligibility for the Federal Emergency Management Agency (FEMA) pre-disaster grant opportunities. This LPSNRD Advanced Hazard Mitigation Plan Update is a multi-jurisdictional plan which covers the following local governments that participated in the planning process.

Figure 1: Participating Jurisdictions



Participating Counties, Cities, & Villages		
Cass County	Village of Cedar Creek	Village of Malcolm
Lancaster County	Village of Ceresco	Village of Manley
City of Ashland	Village of Davey	Village of Murdock
City of Lincoln	Village of Denton	Village of Murray
City of Louisville	Village of Eagle	Village of Brainard
City of Plattsmouth	Village of Elmwood	Village of Panama
City of Waverly	Village of Firth	Village of Roca

Participating Counties, Cities, & Villages		
City of Weeping Water	Village of Greenwood	Village of South Bend
Village of Avoca	Village of Hallam	Village of Union
Village of Bennet	Village of Hickman	Village of Valparaiso
Other Participating Districts		
Contestoga Public Schools	Cass Rural Water District #2	Cass County SID 5
Weeping Water Public Schools	Cass County Rural Water District #1	Cass County SID #1 (Lake WanConDa)
Lower Platte South Natural Resources District		

The purpose of this plan update is to identify hazards; assess the vulnerability of each participant to the various hazards; determine potential losses associated with the hazards; examine the capabilities in place and develop sound mitigation alternatives to reduce these vulnerabilities. The potential for substantial damages as a result of natural or manmade disasters presents a large likelihood for impacts to the health, safety, and welfare of all citizens in the planning area. The risk assessment process led to the development of specific goals and objectives which helped to identify a wide range of mitigation strategies and projects for participating jurisdictions. This update builds upon the prior HMP developed by LPSNRD in 2009, some of the most significant changes in this update are: the inclusion of manmade hazards based on the threats addressed in the State of Nebraska's HMP; greater efforts to reach out to and include stakeholder groups; an expanded risk assessment for both the entire planning area as well as for each participating jurisdiction; and, the inclusion of both generalized mitigation strategies as well as specific projects that will help build stronger, more resilient communities.

This update also works to unify the various planning mechanisms in place throughout the planning area to ensure that the goals and objectives identified in those planning mechanisms are consistent with what is identified in this plan. To achieve this, the "Safe Growth Audit" developed by FEMA and the American Planning Association (APA) was employed to evaluate the documents currently in place and to guide the growth of participating jurisdictions in the future. This plan identifies specific goals and objectives based on the risk assessment process. These goals are to:

Goal 1: Protect the Health and Safety of Residents

Objective 1.1: Reduce or prevent damage to property or prevent loss of life or serious injury (overall intent of the plan).

Goal 2: Reduce Future Losses from Hazard Events

Objective 2.1: Provide protection for existing structures, future development, critical facilities (CF), services, utilities, and trees to the extent possible.

Objective 2.2: Develop hazard specific plans, conduct studies or assessments, and retrofit buildings and facilities to mitigate for hazards and minimize their impact.

Objective 2.3: Minimize and control the impact of hazard events through enacting or updating ordinances, permits, laws, or regulations.

Goal 3: Increase Public Awareness and Education Regarding Vulnerabilities to Hazards

Objective 3.1: Develop and provide information to residents and businesses about the types of hazards they are exposed to, what the effects may be, where they occur, and what they can do to be better prepared.

Goal 4: Improve Emergency Management Capabilities

Objective 4.1: Develop or improve Emergency Response Plans and procedures and abilities.

Objective 4.2: Develop or improve Evacuation Plans and procedures.

Objective 4.3: Improve warning systems and ability to communicate to residents and businesses during and following a disaster or emergency.

Goal 5: Pursue Multi-Objective Opportunities (whenever possible)

Objective 5.1: When possible, use existing resources, agencies, and programs to implement the projects.

Objective 5.2: When possible implement projects that achieve several goals.

This plan is comprised of seven sections and their coverage is discussed as follows:

Section One – Introduction: This section introduces hazard mitigation planning, including an overview of DMA2000, benefits of utilizing the multi-jurisdictional approach, and plan financing and preparation.

Section Two – Planning Process: This section outlines the hazard mitigation planning process used for development of the plan, including hazard identification; resource organization; risk assessment; structural inventory; mitigation strategy; and plan implementation and maintenance. The members of the planning team; public involvement and participation; participating jurisdictions; as well as general plans, documents, and additional information used throughout the planning process are also listed in this section.

Section Three – Community Profile & Capability Assessment: This section provides an overall profile of the planning area including geography, climate, demographics, assets, and direct and indirect participant profiles, as well as local capabilities to ensure implementation.

Section Four – Risk Assessment: This section contains the risk assessment for the planning area including hazard identification, hazard background, historical occurrences, vulnerability assessment, potential losses, and future development and vulnerability for all participants.

Section Five – Mitigation Strategy: This section discusses the establishment of goals and objectives for all participants. The goals and objectives provide the framework for identifying mitigation alternatives or 'action items', the on-the-ground activities to reduce the effects of natural hazards. All action items were evaluated by the participants using the FEMA recommended 'STAPLEE' process.

Section Six – Plan Implementation and Maintenance: This section contains recommendations for plan implementation and maintenance, including the monitoring of hazards, establishment of a panel for the annual plan review, and an outline of the process for updating the plan in the future.

Section Seven – Participant Sections: Participant sections provide information specific to each individual plan participant, which was not covered in the 'Upfront Section'. The risk assessment includes a participant specific hazard identification summary and description of structural inventory and valuation. Also, maps specific to each participant can be found in their respective sections.

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Section One: Introduction

Hazard Mitigation Planning

Hazard events are inevitable. It is just a matter of when they happen and how well a community is prepared for such an event. Mitigation reduces risk and is a socially and economically responsible action to prevent long term risks from natural and man-made hazard events.

FEMA definition of
Hazard Mitigation

"Any sustained action taken to reduce or eliminate the long-term risk to human life and property from [natural] hazards."

Natural hazards, such as severe winter storms, tornados, high winds, severe thunderstorms, flooding, extreme heat, drought, agriculture diseases (plant and animal), earthquakes, landslides, and wildfires are a part of the world around us. Their occurrence is natural and inevitable, and there is little we can do to control their force and intensity. Man-made hazards are a product of the society that we live in and can occur with significant impacts to communities. Man-made hazards include levee failure, dam failure, chemical and radiological fixed site hazards, major transportation incidents, terrorism, civil disorder, and urban fire. These hazard events can occur naturally or as a result of human error. All jurisdictions participating in this planning process are vulnerable to a wide range of natural and man-made hazards that threaten the safety of residents, and have the potential to damage or destroy both public and private property, cause environmental degradation, or disrupt the local economy and overall quality of life.

Mitigation planning is described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster associated loss. A core assumption of hazard mitigation planning is that pre-disaster investments will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery, and reconstruction. Furthermore, mitigation practices will enable local residents, businesses, and industries to re-establish themselves in the wake of a disaster, getting the local economy back on track sooner and with minimal interruption.

The benefits of mitigation planning go beyond reducing hazard vulnerability. Measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple local goals like preserving open space, improving water quality, maintaining environmental health, and enhancing recreational opportunities. Mitigation planning also offers the following benefits:

- Saving lives and property;
- Saving money;
- Speeding up recovery following disasters;
- Reducing future vulnerability through wise development and post-disaster recovery and reconstruction;
- Enhancing coordination within and across participating jurisdictions;
- Expediting the receipt of pre-disaster and post-disaster grant funding; and,
- Demonstrating a firm commitment to improving local health and safety.

As a jurisdiction formulates a comprehensive approach to reduce the impacts of hazards, a key means to accomplish this task is through the development, adoption, and regular update of a HMP. A HMP establishes the vision, guiding principles, and specific actions designed to reduce current and future hazard vulnerabilities. The LPSNRD Multi-Jurisdictional Hazard Mitigation Plan is an effective tool to incorporate hazard mitigation principles and practices into the day-to-day activities of county and municipal governments. This plan offers specific actions designed to protect residents, as well as the built environment from those hazards that pose the greatest risk. Identified mitigation actions go beyond recommendations for structural solutions to reduce existing vulnerability, such as elevation, retrofitting, and acquisition projects. Local policies on growth and

development; incentives tied to natural resource protection; and public awareness and outreach activities are examples of other actions intended to reduce future vulnerability to identified hazards.

DMA2000

In an effort to reduce the nation's mounting natural disaster losses, the U.S. Congress passed the DMA 2000 to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a HMP in order to remain eligible for pre- and post-disaster mitigation funding. These funds include the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA). They are administered by the FEMA under the Department of Homeland Security (DHS).

This plan was developed in accordance with current state and federal rules and regulations governing local HMPs. The plan shall be monitored and updated on a routine basis to maintain compliance with the legislation – Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the DMA2000 (P.L. 106-390) and by FEMA's Final Rule (FR) published in the Federal Register on November 30, 2007, at 44 Code of Federal Regulations (CFR) Part 201.

HAZARD MITIGATION ASSISTANCE (HMA) & NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

On June 1, 2009, FEMA initiated the HMA program integration, which aligned certain policies and timelines of the various mitigation programs. These HMA programs present a critical opportunity to minimize the risk to individuals and property from hazards while simultaneously reducing the reliance on federal disaster funds. In addition to the HMA, communities can participate in the Community Rating System (CRS) in order to reduce vulnerabilities and inform residents.

> ***Mitigation*** *is the cornerstone of emergency management. Mitigation focuses on breaking the cycle of disaster damage, reconstruction, and repeated damage. Mitigation lessens the impact disasters have on people's lives and property through damage prevention, appropriate development standards, and affordable flood insurance. Through measures such as avoiding building in damage-prone areas, stringent building codes, and floodplain management regulations, the impact on lives and communities is lessened.*
>
> *- FEMA Mitigation Directorate*

Each HMA program was authorized by separate legislative action, and as such, each program differs slightly in scope and intent.

- ***HMGP*****:** To qualify for post-disaster mitigation funds, local jurisdictions must have adopted a mitigation plan that is approved by FEMA. HMGP provides funds to states, territories, Indian tribal governments, local governments, and eligible private non-profits following a presidential disaster declaration. The DMA 2000 authorizes up to 7% of HMGP funds available to a state after a disaster to be used for the development of state, tribal, and local mitigation plans.
- ***FMA:*** To qualify to receive grant funds to implement projects such as acquisition or elevation of flood-prone homes, local jurisdictions must prepare a mitigation plan. The plan must include specific elements and be prepared in conjunction with the process outlined in the NFIP and Community Rating System (CRS). The goal of FMA is to reduce or eliminate claims under the NFIP.
- ***PDM*****:** To qualify for PDM funds, local jurisdictions must adopt a mitigation plan that is approved by FEMA. PDM assists states, territories, Indian tribal governments, and local governments in implementing a sustained pre-disaster hazard mitigation program.
- ***NFIP CRS:*** The CRS offers recognition to local governments that exceed minimum requirements of the NFIP (refer to *Section Four: Risk Assessment* – Flooding). Recognition comes in the form of discounts on flood insurance policies purchased by citizens. The CRS offers credit for mitigation plans that are prepared according to a multi-step process.

Multi-Jurisdictional Approach

According to FEMA, "A multi-jurisdictional HMP is a plan jointly prepared by more than one jurisdiction." The term 'jurisdiction' means 'local government'. Title 44 Part 201, Mitigation Planning in the CFR, defines a 'local government' as "any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments, regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, any rural community, unincorporated town or village, or other public entity". For the purposes of this plan, any 'taxing authority' was also included.

FEMA recommends the multi-jurisdictional approach under the DMA 2000 for the following reasons:

- It provides a comprehensive approach to the mitigation of hazards that affect multiple jurisdictions;
- It allows economies of scale by leveraging individual capabilities and sharing cost and resources;
- It avoids duplication of efforts; and
- It imposes an external discipline on the process.

Both FEMA and NEMA recommend this multi-jurisdictional approach through a combination of counties and regional emergency management districts. The LPSNRD utilized the multi-jurisdiction planning process recommended by FEMA to develop this plan.

Plan Financing and Preparation

In regards to plan financing and preparation, in general, the local government (LPSNRD) is the "sub-applicant" that is the eligible entity that submits a sub-application for FEMA assistance to the "Applicant". The "Applicant," in this case is the State of Nebraska. If HMA funding is awarded, the sub-applicant becomes the "sub-grantee" and is responsible for managing the sub-grant and complying with program requirements and other applicable federal, state, territorial, tribal, and local laws and regulations.

The LPSNRD HMP Update was financed through the HMGP program after FEMA Disaster DR- 4013 (project DR4013-NE0002). HMGP grants are allocated from FEMA to NEMA using a 'sliding scale' formula based on the percentage of funds spent on public and individual assistance programs for each presidentially-declared disaster. For states with a standard state mitigation plan, the formula provides 15%of the first $2 billion of estimated aggregate amounts of disaster assistance; 10% for the next portion of amounts between $2 billion and $10 billion; and 7.5% for the next portion of amounts between $10 billion and $35.333 billion.

The LPSNRD applied for an HMGP planning grant and received federal-cost share on April 27, 2012 to provide 75% assistance for the completion of a 'multi-jurisdictional' HMP update. A multi-jurisdictional plan includes any 'taxing authority' such as cities, villages, counties, school districts, or other special districts. In total, 37 jurisdictions participated in the LPSNRD Plan.

Section Two: Planning Process

Summary of Changes

The planning process followed for this plan update was similar to that followed for the prior HMP. However, some changes were incorporated in order to build upon the lessons learned from the prior planning effort:

The update included a more diverse and inclusive planning team including school district superintendents, representatives from the University of Nebraska, City of Lincoln and Lancaster County planning department, and a county engineer as well as county emergency management directors, staff from LPSNRD, Nebraska Department of Natural Resource (NDNR), Nebraska Emergency Management Agency (NEMA), and consultants from JEO Consulting Group, Inc. (JEO) ;

- Multiple stakeholder groups were identified and invited to participate in updating the plan;
- Additional efforts were made to engage the public through the use of MindMixer and other online tools including the LPSNRD Website, JEO's Mitigation Planning Website, and Survey Monkey; and,
- The hazards considered were expanded to include all hazards addressed by the 2014 State of Nebraska Hazard Mitigation Plan.

***Requirement §201.6(b)**: Planning process. An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

***Requirement §201.6(c)(1)**: [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Hazard Mitigation Planning Process

The hazard mitigation planning process has four general steps, which include organization of resources; assessment of risks; development of mitigation strategies; and implementation and annual monitoring of the plan's progress. The mitigation planning process is rarely a linear process. It is not unusual that ideas developed during the assessment of risks may need revision or additional information while updating the mitigation plan or that implementation of the plan may result in new goals or additional risk assessment.

- Organization of Resources
  - Focus on the resources needed for a successful mitigation planning process. Essential steps include:
    - Organizing interested community members
    - Identifying technical expertise needed
- Assessment of Risks
  - Identify the characteristics and potential consequences of the hazard. Identify how much of the jurisdiction can be affected by specific hazards and the impacts they could have on local assets.
- Mitigation Plan Development
  - Determine priorities and identify possible solutions to avoid or minimize the undesired effects. The result is a HMP and strategy for implementation.
- Plan Implementation and Progress Monitoring
  - Bring the plan to life by implementing specific mitigation projects and changing day-to-day operations. It is critical that the plan remains relevant to succeed. Thus, it is important to conduct periodic evaluations and revisions, as needed.

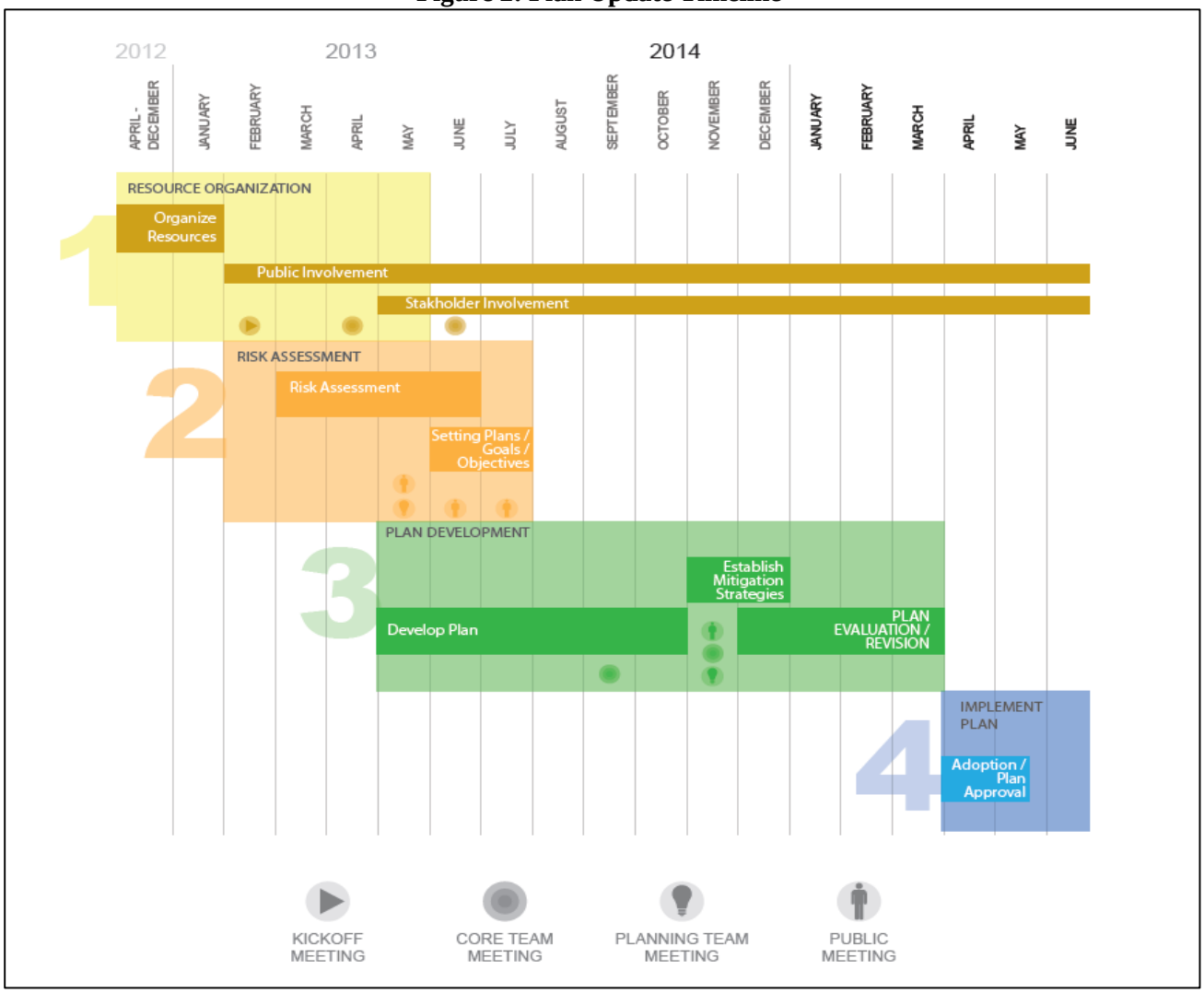
Plan Update Process

The LPSNRD began the process of securing funding for their multi-jurisdictional HMP on April 27, 2012. JEO was contracted in November 2012 to guide and facilitate the planning process and assemble the multi-jurisdictional HMP. For the LPSNRD, Paul Zillig led the development of the plan at the staff level and served as the primary point-of-contact throughout the project. The project kick-off meeting with the LPSNRD and JEO provided an overview of the work to be completed over the following three months including: the identification of additional potential participants (particularly school districts); identification of and coordination with the planning team; determination of number and location of future public meetings (if necessary); assessment of the attendance requirements; and discussion of what types of information would need to be provided to the consultant to successfully complete the plan.

The first activity in the update process for the LPSNRD HMP was coordination of efforts with local, state, and federal agencies and organizations. Also, the NDNR and NEMA became involved in the planning process. The LPSNRD and JEO then worked together to identify elected officials and key stakeholders to lead the planning effort.

A clear timeline of this plan update progress is provided in Figure 2:

Figure 2: Plan Update Timeline



Resource Organization

PLANNING TEAM

At the beginning of the planning process, the planning team, comprised of local participants and the consultant, was established to guide the planning process, review the plan, and serve as a liaison to plan participants throughout the planning area. The planning team was designed to be a steering community and not necessarily include a member from every community in the planning area. The planning team designated a core team which would be involved in daily decision making, meet more frequently throughout the plan update process, and report back to the planning team on any activities. A list of planning team members, with core team members designated, can be found in the Table 1. Additional technical support was provided to the planning team through staff from NEMA and the NDNR.

Table 1: Hazard Mitigation Planning Team

Name	Title	Jurisdiction
Doug A. Ahlberg+	Director	Lancaster County Emergency Management
Mark Hosking	Deputy Director	Lancaster County Emergency Management
Dr. Beth Johnsen	Superintendent	Conestoga Public Schools
Ed Ubben+	Projects Coordinator	LPSNRD
Jared Nelson	Engineer	City of Lincoln
Mark Robertson	Emergency Preparedness Coordinator	UNL Emergency Management
Paul Zillig+	Assistant General Manager	LPSNRD
Sandy Weyers+	Emergency Management Director	Cass County Emergency Management
Sara Hartzell	Planner	Lincoln - Lancaster County Planning
Earl Imler**	Response and Recovery Section Manager	NEMA
Mary Baker**	Nebraska State Hazard Mitigation Officer	NEMA
Miranda Rogers**	Hazard Mitigation Planning Specialist	NEMA
Sheila Hascall**	Nebraska State Hazard Mitigation Officer	NEMA
John Callen+*	Natural Resources Planning Coordinator	NDNR
Mitch Paine*	Flood Mitigation Planning Coordinator	NDNR
Dr. Alessandra Jerolleman*	Senior Planner	JEO
Jeff Henson*	Project Coordinator	JEO
Jeffery B. Ray*	Planning Department Manager	JEO
Lalit Jha*	Project Manager	JEO

+Core team
**External Contributors*
***External Contributors Participating Part of the Process*

The Planning Team meetings were held on:

- May 15, 2013: Presented the materials for the Hazard ID meeting.
- November 19, 2013: Presented data collected and review project identification process for the Mitigation Strategies Meeting.

- The Core Team met on:
- February 12, 2013: Project Kick-off meeting.
- April 9, 2013: Outlined the HMP process and structure.
- June 25, 2013: Gave an update on public participation and steps forward.

- September 26, 2013: Review of project status and discussion of risk assessment methodology.
- November 13, 2013: Review initial draft of HMP and discussion of project prioritization process.

PARTICIPANT INVOLVEMENT

Elected officials, key stakeholders, and residents within LPSNRD experience the area hazards first hand and play a key role in providing local information necessary to complete the plan. Participants played a key role in the identification of hazards; understanding the community's perception of risk; providing a record of historical disaster occurrences and localized impacts; reviewing existing goals and objectives; approval of newly established goals and objectives; identification and prioritization of potential mitigation projects and strategies; and, the development of annual review procedures.

In order to be a participant in the development of this plan update, jurisdictions were required to have at a minimum one representative present at both the "Hazard Identification" and "Mitigation Alternatives" meetings or serve on the planning team. Some jurisdictions opted to have multiple community members present at both rounds of meetings. Sign-in sheets from all public meetings can be found in *Appendix B*. Jurisdictions were encouraged to invite stakeholder groups from within their communities to participate in the public meetings.

Jurisdictions that were unable to have a representative attend the scheduled public meetings, were able to schedule a one-on-one meeting with the planning team. During one-on-one meetings local representatives or local planning teams discussed meeting materials and completed project materials. This effort enabled jurisdictions which could not attend a scheduled public meeting to participate in the plan.

The Hazard Identification meetings were held on:

- May 15, 2013: Lincoln, NE, explained the HMP process and requirements to participants and members of the public.
- May 30, 2013: Weeping Water, NE, explained the HMP process and requirements to participants and members of the public.

The intent of these meetings was to provide the public and jurisdictional representatives with an overview of the work to be completed and discuss what types of information would need to be provided to complete the plan. Meeting worksheets were distributed utilizing a community engagement website (mindmixer) to provide an opportunity to gather input on the identification of hazards, records of historical occurrences, establishment of goals and objectives, and potential mitigation alternatives from jurisdictional representatives as well as members of the community (refer to *Appendix C*). All project worksheets were posted on the website (www.hazardtalk.com) anyone completing the survey had to create an account with the service provider which allowed for tracking who had completed surveys and in which community they lived. Table 2 outlines notifications and outreach efforts utilized during the planning process.

Table 2: Public Notification - 'Hazard Identification' Meetings

Action	Intent
Project Kick-Off Letter	Sent to participants to announce the purpose of the plan
Posting of 2009 LPSNRD HMP	2009 LPS HMP posted for public viewing on LPSNRD website and JEO Hazard Planning website
Hazard Identification Letter	Sent to participants to discuss the agenda/dates/times/locations of the first round of public meetings
planning team Letter	Informed the planning team about their first meeting
Neighboring Jurisdictions Letter	Informed neighboring jurisdictions about the planning effort
Press Release	Sent to each local newspapers to describe the purpose of the plan
Project Announcement	Project Announcement Posted on LPSNRD's website
Follow-up Phone Call	Potential participants were called to remind them about the upcoming meetings

Action	Intent
Follow-up Emails and Phone Calls	Participating jurisdictions were contacted to encourage them to finish the Hazard ID worksheets
Word-of-Mouth	Staff discussed the plan with jurisdictions throughout the planning process

Risk Assessment

HAZARD IDENTIFICATION

The LPSNRD is vulnerable to a wide array of natural and man-made or technological hazards that threaten life and property. At the hazard identification meetings, the planning team reviewed the following hazards consistent with the State of Nebraska Hazard Mitigation Plan (2014) to conduct further risk and vulnerability assessment based on these hazards' previous occurrence and the communities' exposure to the hazards:

- Severe Winter Storms (Severe Winter Storms and Extreme Cold)
- Tornados
- High Winds (Windstorms)
- Severe Thunderstorms (Thunderstorm, and Lighting)
- Hail (Hailstorms)
- Flooding (Riverine and Flash)
- Extreme Heat
- Drought
- Earthquakes
- Wildfires
- Levee Failure
- Dam Failure
- Ag Diseases
- Fixed Site Hazards (Chemical & Radiological)
- Transportation Incidents (Chemical, Radiological, and Severe Incidents)
- Terrorism
- Civil Disorder
- Urban Fire
- Expansive Soils
- Sink Holes
- Landslides

For hazards profiles and risk assessment please refer to *Section Four: Risk Assessment* for details.

HAZARD RISK & VULNERABILITY ASSESSMENT

The LPSNRD HMP established a hazard risk assessment methodology to assess the potential risk and vulnerability of the entire planning area and of each participating jurisdiction. The risk assessment methodology utilizes a combination of: public input and information provided by elected officials, key stakeholders, and residents throughout the planning area; publically available data on previous occurrences; and, other sources of information where available.

> ***Risk*** *is the potential loss associated with a hazard, defined in terms of probability, rate of recurrence, extent, severity, and end result.*
>
> ***Vulnerability*** *is the identification of what is capable of being affected as the result of a hazard.*

More detailed hazard risk and vulnerability assessment information can be found in *Section Four: Risk Assessment*. This includes: the calculation of average annual damages; discussion of significant previous occurrences; and, the use of Hazards United States-Multi Hazard (HAZUS-MH) and Special Flood Hazard Area (SFHA) data for flooding.

Information specific to each jurisdiction, including the results of their unique composite risk calculations can be found in their respective sections in *Section Seven: Participant Sections*.

CAPABILITY ASSESSMENT

The purpose of conducting a capability assessment is to evaluate a jurisdiction's ability to implement mitigation actions. The process assists with the determination of which actions are feasible or are likely to be implemented over time given the jurisdiction's planning and regulatory, administrative and technical, fiscal, and educational capability. In addition, it provides the opportunity to assess existing planning endeavors in place, to identify any gaps or weaknesses within existing government activities that might result in increasing community vulnerability, and to highlight positive actions already in place that should be continually supported.

The capability assessment was conducted through a detailed online survey *(see Appendix C)* that was sent out to the designated representative of each participating jurisdiction within LPSNRD at the Mitigation Alternative Meeting in November, 2013. The survey questionnaire requested information on capability indicators such as existing planning endeavors, local policies, programs and ordinances, personnel resources, and budgetary that would strengthen or weaken the localities' ability to implement identified hazard mitigation actions. The survey respondents were also asked questions related to their political will to carry out hazard mitigation planning and to implement mitigation actions.

Plan Update

SET PLANNING GOALS AND OBJECTIVES

The planning team reviewed the goals and objectives stated in the 2009 LPSNRD Mitigation Plan then revised these goals and objectives, as well as added new goals and objectives based on input collected at public meetings. Please refer to *Section Five: Mitigation Actions* for specific mitigation goals and objectives.

ESTABLISH MITIGATION STRATEGIES

The Mitigation Strategies meetings were held on:

- November 19, 2013: Lincoln, NE – review of collected data and introduction of the STAPLEE project prioritization process.
- November 21, 2013: Weeping Water, NE – review of collected data and introduction of the STAPLEE project prioritization process.

The intent of these meetings was to provide an opportunity for the public to review a draft of the plan and collect any additional information necessary to finish the plan. Meeting worksheets were distributed to provide an opportunity for plan participants to evaluate and prioritize mitigation alternatives, as well as update CFs, and highly vulnerable areas and populations (refer to *Appendix C*).

PUBLIC INVOLVEMENT AND OUTREACH

Below is a summary from the LPSNRD of how information was locally distributed to the public throughout the planning process to facilitate their involvement in the updating of this plan.

At the beginning of the planning process the planning team worked to identify stakeholder groups that could serve as "hubs of communication" throughout the planning process. A wide range of stakeholder groups were contacted and encouraged to participate. Fifty-nine stakeholder groups were invited to participate in the plan. Only two groups the Nebraska Heart Hospital and Milder Manor Nursing Home (now Sumner Place) attended the May 16, 2013, meeting. The Nebraska Heart Hospital was represented by Jim Bouc, the plant operator and Sumner Place was represented by Ty Andrews, of the environmental services department. Outreach included notification prior to all public meetings, phone call and email reminders of upcoming meetings, and invitations to complete surveys online designed specifically for groups and individuals to offer insights and suggestions for the planning process. HazardTalk.com was used to post Stakeholder Surveys, as well as Community Participation Surveys for participating jurisdictions. HazardTalk.com was introduced at the "Hazard

Identification" meetings as well as including in press release throughout the planning process. Community members were also directed to LPSNRD's website which included a project announcement and a copy of the 2009 LPSNRD HMP as well as hosting a draft of the 2015 LPSNRD Multi-Jurisdictional Hazard Mitigation Plan which was made available for public review and comment.

Stakeholder Groups included representatives from nursing homes, colleges and universities, private and parochial schools, and hospitals. Stakeholder groups were encouraged to disperse information to their membership to gain a better, better-rounded understanding of community concerns and needs. Project updates were provided to stakeholder groups who participated in the planning process. Project updates were sent via email to everyone who attended either the "Hazard Identification" or "Mitigation Strategies" meetings.

PLAN APPROVAL AND ADOPTION

Based on FEMA requirements, this multi-jurisdictional HMP must be formally adopted by each participant through approval of a resolution. This approval will create 'individual ownership' of the plan by each participant. Formal adoption provides evidence of a participant's full commitment to implement the plan's goals and objectives and action items.

> ***Requirement §201.6(c)(5)**: For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.*

Once adopted, participants are responsible for implementing and updating the plan every five years. In addition, the plan will need to be reviewed and updated annually or when a hazard event occurs that significantly affects the area or individual participants. Copies of resolutions approved by each participant are located in *Appendix A*.

GENERAL PLANS, DOCUMENTS, AND INFORMATION

General plans, documents, and information used throughout the development and update of the plan are listed in Table 3:

Table 3: General Plans, Documents, and Information

Documents	Source
Disaster Mitigation Act of 2000 (DMA)	http://www.fema.gov/media-library/assets/documents/4596?id=1935
Final Rule (FR) (2007)	http://www.fema.gov
Local Multi-Hazard Mitigation Planning Guidance (Blue Book) (2008)	http://www.fema.gov
Local Mitigation Planning Handbook (2013)	http://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf
Hazard Mitigation Assistance Unified Guidance (2013)	http://www.fema.gov/hazard-mitigation-assistance
What is a Benefit: Guidance on Benefit-Cost Analysis on Hazard Mitigation Projects	http://www.fema.gov/benefit-cost-analysis
The Census of Agriculture (2012)	http://www.agcensus.usda.gov/
National Flood Insurance Program Community Status Book (2014)	http://www.fema.gov/cis/NE.html
Local Mitigation Plan Review Guide (2013)	http://www.fema.gov
Plans/Studies	**Source**
Nebraska Drought Mitigation and Response Plan (2000)	http://carc.nebraska.gov/docs/NebraskaDrought.pdf
Flood Insurance Study	http://www.fema.gov/floodplain-management/flood-insurance-study
State of Nebraska Hazard Mitigation Plan (2014)	http://www.nema.ne.gov/pdf/hazmitplan.pdf

Plans/Studies	Source
Nebraska Geological Survey Landslide Study	http://snr.unl.edu/csd/surveyareas/geology.asp
Community Comprehensive Plans/Zoning and Subdivision Regulations	From respective communities
Data Sources/Technical Resources	**Source**
Federal Emergency Management Agency (FEMA)	http://www.fema.gov
United States Department of Commerce	http://www.commerce.gov/
National Oceanic Atmospheric Administration (NOAA)	http://www.noaa.gov/
National Environmental Satellite, Data, and Information Service	http://www.nesdis.noaa.gov/
National Climatic Data Center (NCDC)	http://www.ncdc.noaa.gov
Storm Prediction Center Statistics	http://www.spc.noaa.gov
United States Geological Survey (USGS)	http://www.usgs.gov/
United States Department of Agriculture (USDA)	http://www.usda.gov
USDA – Risk Assessment Agency (RMA)	http://www.rma.usda.gov
National Agricultural Statistics Service	http://www.nass.usda.gov/
High Plains Regional Climate Center	http://www.hprcc.unl.edu
United States Census Bureau	http://www.census.gov
National Flood Insurance Program (NFIP)	http://www.fema.gov
NFIP Bureau and Statistical Agent	http://www.fema.gov/national-flood-insurance-program
FEMA Map Service Center	http://www.msc.fema.gov
National Drought Mitigation Center (NDMC) – Drought Monitor	http://drought.unl.edu/dm/monitor.html
NDMC – Drought Impact Reporter	http://www.droughtreporter.unl.edu
National Historic Registry	http://www.nps.gov/nr
United States Small Business Administration (SBA)	http://www.sba.gov
NEMA	http://www.nema.ne.gov
Nebraska Climate Assessment Response Committee (CARC)	http://carc.agr.ne.gov
NDNR	http://www.dnr.ne.gov
Nebraska Department of Natural Resource – GIS	http://dnrdata.dnr.ne.gov
NDNR – Dam Inventory	http://dnrdata.dnr.ne.gov/Dams/Search.aspx?mode=county
NDNR – Soils Data	http://www.dnr.ne.gov/databank/soilsall.html
Natural Resources Conservation Service	www.ne.nrcs.usda.gov
Nebraska Forest Service	http://www.nfs.unl.edu/
Nebraska Forest Service – Wildland Fire Protection Program	http://nfs.unl.edu/program-wildlandfireprotection.asp
Nebraska Association of Resources Districts	http://www.nrdnet.org
Nebraska Public Power District Service	http://sites.nppd.com
Nebraska Department of Revenue – Property Assessment Division	http://www.revenue.ne.gov/PAD
UNL – College of Agricultural Sciences & Natural Resources – Schools of Natural Resources	http://casnr.unl.edu
High Hazard Dam Inundation Area/Information	http://dnr.ne.gov/website

Plan Implementation and Progress Monitoring

HMPs need to be living documents. To ensure this, the plan must be monitored, evaluated, and updated on a five-year or less cycle. This includes incorporating the mitigation plan into county and local comprehensive or capital improvement plans as they are developed. Section six describes the system that participating jurisdictions in the LPSNRD have established to monitor the plan; provides a description of how, when, and by whom the HMP process and mitigation actions will be evaluated; presents the criteria used to evaluate the plan; and explains how the plan will be maintained and updated.

Section Three: Community Profile and Capability Assessment

Summary of Changes

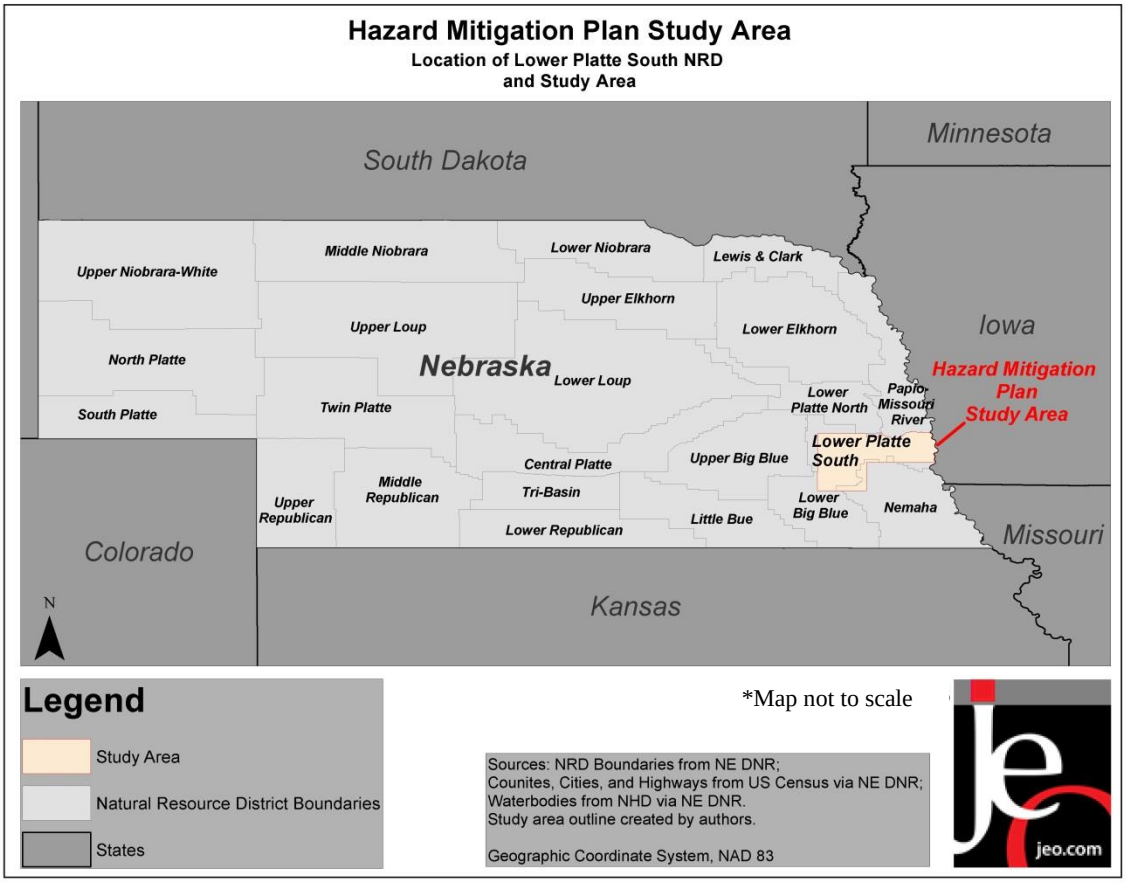
- Changes to the profile (expanded analysis)
- The majority of participating jurisdictions completed a Capability Assessment to determine their ability to implement mitigation strategies/projects in their community.

Planning area Geographic Summary

The LPSNRD is located in southeastern Nebraska and is made up of the majority of Lancaster and Cass counties as well as portions of Seward, Saunders, Otoe, and Butler counties. This region lies in a topographic region of 'rolling hills'. Rolling hills are elevated land with moderate to steep slopes and rounded ridge crests. In southeastern Nebraska, the rolling hills are mostly glacial till that has been eroded and mantled by loess.

The District consists of the Salt Creek Watershed and the Weeping Water Creek Watershed. The Salt Creek Watershed is comprised of a series of sub-basins such as; Antelope Creek, Beal Slough, Cardwell Branch, Deadman's Run, Callahan, Dee, Haines Branch, Little Salt Creek, Lynn Creek, Middle Creek, Oak Creek, Southeast Upper Salt Creek (SEUSC), and Stevens Creek basins. The District mostly drains into the Platte River along with the Missouri River to the east. As described by its name, the area is considered the southern portion of the Lower Platte River watershed.

Figure 3: Location of LPSNRD



The LPSNRD owns and maintains eight public access lakes, three recreational trails, and saline wetlands, located in Lincoln and Lancaster County. Saline wetlands are classified as such by the levels of salinity found in the soil. The saline wetlands are one of the earth's most rare ecosystems; only 4,000 acres of the estimated 20,000 that originally existed, remain today. The LPSNRD's wetlands are home to two endangered species, thus it is especially important to make thorough efforts to conserve these wetlands.

Demographics and Assets Summary

Demographic and asset information can be used to determine differing levels of vulnerability by analyzing data on population and housing, structural inventories and valuations, CFs, and highly vulnerable areas and populations for each participating jurisdiction.

POPULATION AND HOUSING

Table 4 to Table 8 below summarize various population and housing characteristics such as population trends; population by age; housing occupancy and tenure; and age of structures. Table 8 highlights selected demographic characteristics including housing units lacking complete facilities; mobile home housing units; and population 65 and older with a disability.

Table 4 provides a summary of population changes from 2000 to 2010. The percent of change was then used to project the population for 2020. This is a relatively simple method to predict population change and it does not account for predominant age cohorts in the community, birth and death rates, or in and out migration which will likely impact the rate of growth or decline.

As populations change, either growing or declining, the vulnerability of the community is impacted. If a community grows quickly it may lack resources to provide services for all members of the community in a reasonable timeframe, this could include issues like snow removal, emergency storm shelters, repairs to damaged infrastructure, or even tracking the location of vulnerable populations. Communities experiencing population decline may be more vulnerable to hazards as a result of vacant and/or dilapidated structures, an inability to properly maintain CFs and/or infrastructure, and higher levels of unemployment and population living in poverty. It is important for communities to monitor their population changes and ensure that those issues be incorporated into HMPs, as well as other planning mechanisms within the community.

Table 4: Population Trends 2000-2010

Jurisdiction	2000 Population	2010 Population	Change	2020 Projected Population
Alvo	142	132	-7.04%	123
Avoca	270	242	-10.37%	217
Cedar Creek	396	390	-1.52%	384
Eagle	1,105	1,024	-7.33%	949
Elmwood	668	634	-5.09%	602
Greenwood	544	568	4.41%	593
Louisville	1,046	1,106	5.74%	1,169
Manley	191	178	-6.81%	166
Murdock	269	236	-12.27%	207
Murray	481	463	-3.74%	446
Nehawka	232	204	-12.07%	179
Plattsmouth	6,887	6,502	-5.59%	6,139
South Bend	86	99	15.12%	114
Union	260	233	-10.38%	209

Jurisdiction	2000 Population	2010 Population	Change	2020 Projected Population
Weeping Water	1,103	1,050	-4.81%	999
Cass County	24,334	25,241	3.73%	26,182
Bennet	570	719	26.14%	907
Davey	153	154	0.65%	155
Denton	189	190	0.53%	191
Firth	564	590	4.61%	617
Hallam*	(2010)* 213	(2012)* 216	1.4%*	220*
Hickman	1,111	1,657	49.14%	2,471
Lincoln	225,581	258,379	14.54%	295,947
Malcolm	413	382	-7.51%	353
Panama	253	256	1.19%	259
Raymond	186	167	-10.22%	150
Roca	220	220	0.00%	220
Sprague	146	142	-2.74%	138
Waverly	2,448	3,277	33.86%	4,387
Lancaster County	250,291	285,407	14.03%	325,449
Ashland	2,262	2,453	8.44%	2,744
Brainard	351	330	-5.98%	310
Ceresco	920	889	-3.37%	859
Valparaiso	563	570	1.24%	577
LPSNRD	**278,721**	**314,890**	**12.98%**	**356,121**

Source: United States Census Bureau – 2000, 2010

**The village of Hallam was significantly impacted by a tornado in 2004, as a result the population of the community has decreased significantly from 2000 (population of 304) to 2010 (population of 213). For the purpose of the population projections Hallam's population change from 2010 to 2012 was used to project the 2020 population. It should be noted that this projection is based on a very narrow timeframe and provides a very rough estimate for population change.*

Overall, the planning area's population was 278,721 persons in 2000 and 314,890 persons in 2010. This is an increase of 36,169 people, or 12.98%, in ten years. The rural population was 24,739 persons in 2000 which increased to 26,499 persons in 2010, an increase of 2,260 people, or 9.14%. The urban population was 253,982 persons in 2000 and 288,391 persons in 2010, an increase of 34,409 people, or 13.55%. While this appears to be significant growth throughout the planning area, most growth occurred in a select number of communities. Communities with a population of 500 or less (18 communities) experienced a decline during this ten year period of over 6%. Communities with a population between 500 and 1,000 (six communities), with the exception of the city of Bennett, experienced a very slight population decline from 2000 to 2010, less than 1% decline. Communities with a population of over 1,000 and fewer than 7,000 (seven communities) experienced a population increase of nearly 7%. Again, growth in these communities was focused primarily in a small number of communities. The cities of Hickman, Ashland, and Waverly accounted for most of the population increase within these communities.

The most significant growth in the planning area is occurring in communities along Interstate 80 between Lincoln and Omaha and in communities southeast of Lincoln. These growth patterns present some concerns from a risk management perspective. Chemical, radiological, and other traffic incidents can have real and significant impacts on these communities. Communities along major transportation corridors, like Interstate 80, should develop and/or update planning mechanisms to ensure their population is insulated as much as possible

from potential impacts. The Lancaster County Emergency Management Agency has developed protocols to address the concerns posed by the major transportation routes. The Local Emergency Operations Plan addresses this threat and Lancaster Couth EMA has conducted a table top exercise in 2014 to simulate a chemical release during transportation incident. Additionally, severe winter storms can significantly impact these communities.

Communities with decreasing population are located primarily in more rural areas, away from metropolitan centers and major transportation corridors. As these communities experience population decline, they become more vulnerable to the impacts from natural and manmade hazards. Declining populations often result in higher rates of empty or vacant properties, declining or poorly maintained infrastructure, and reduced response and recovery capabilities.

Table 5: Population by Age

Jurisdiction	< 5 - 9	10 - 19	20 - 34	35 - 54	55 - 64	65 - 84	> 85	Median	Total
Alvo	26	16	32	32	13	12	1	30.7	**132**
	20%	12%	24%	24%	10%	9%	1%		**100%**
Avoca	33	42	37	72	26	27	5	37.3	**242**
	14%	17%	15%	30%	11%	11%	2%		**100%**
Cedar Creek	43	43	32	112	62	90	8	50.3	**390**
	11%	11%	8%	29%	16%	23%	2%		**100%**
Eagle	188	124	230	291	111	70	10	32.7	**1,024**
	18%	12%	22%	28%	11%	7%	1%		**100%**
Elmwood	98	110	97	170	66	76	17	36.7	**634**
	15%	17%	15%	27%	10%	12%	3%		**100%**
Greenwood	67	75	105	178	74	61	8	40.7	**568**
	12%	13%	18%	31%	13%	11%	1%		**100%**
Louisville	159	136	222	296	123	130	40	37.4	**1,106**
	14%	12%	20%	27%	11%	12%	4%		**100%**
Manley	22	31	24	55	23	23	0	43.5	**178**
	12%	17%	13%	31%	13%	13%	0%		**100%**
Murdock	23	20	49	62	42	35	5	44	**236**
	10%	8%	21%	26%	18%	15%	2%		**100%**
Murray	58	65	70	128	59	71	12	41.4	**463**
	13%	14%	15%	28%	13%	15%	3%		**100%**
Nehawka	28	27	34	49	33	31	2	41.6	**204**
	14%	13%	17%	24%	16%	15%	1%		**100%**
Plattsmouth	972	932	1199	1743	701	761	194	36.5	**6,502**
	15%	14%	18%	27%	11%	12%	3%		**100%**
South Bend	8	12	17	30	13	18	1	44.8	**99**
	8%	12%	17%	30%	13%	18%	1%		**100%**
Union	41	24	45	75	24	21	3	36.1	**233**
	18%	10%	19%	32%	10%	9%	1%		**100%**

Jurisdiction	< 5 - 9	10 - 19	20 - 34	35 - 54	55 - 64	65 - 84	> 85	Median	Total
Weeping Water	141	155	193	301	124	119	17	38	**1,050**
	13%	15%	18%	29%	12%	11%	2%		**100%**
Cass County	3,385	3,577	3,750	7,410	3,516	3,072	531	41	**25,241**
	13%	14%	15%	29%	14%	12%	2%		**100%**
Bennet	121	79	185	186	65	79	4	32.9	**719**
	17%	11%	26%	26%	9%	11%	1%		**100%**
Davey	19	26	23	44	18	21	3	39.6	**154**
	12%	17%	15%	29%	12%	14%	2%		**100%**
Denton	33	17	39	51	22	26	2	37.6	**190**
	17%	9%	21%	27%	12%	14%	1%		**100%**
Firth	95	105	108	141	33	83	25	34.2	**590**
	16%	18%	18%	24%	6%	14%	4%		**100%**
Hallam	42	21	43	68	24	13	2	35.1	**213**
	20%	10%	20%	32%	11%	6%	1%		**100%**
Hickman	332	253	346	435	163	96	32	31.8	**1,657**
	20%	15%	21%	26%	10%	6%	2%		**100%**
Lincoln	35494	33692	71330	62906	27224	23238	4495	31.8	**258,379**
	14%	13%	28%	24%	11%	9%	2%		**100%**
Malcolm	56	57	60	121	59	28	1	38.7	**382**
	15%	15%	16%	32%	15%	7%	0%		**100%**
Panama	41	46	35	72	33	26	3	38	**256**
	16%	18%	14%	28%	13%	10%	1%		**100%**
Raymond	12	28	26	60	27	12	2	45.2	**167**
	7%	17%	16%	36%	16%	7%	1%		**100%**
Roca	33	35	45	74	21	11	1	34.5	**220**
	15%	16%	20%	34%	10%	5%	0%		**100%**
Sprague	17	16	30	39	17	17	6	39	**142**
	12%	11%	21%	27%	12%	12%	4%		**100%**
Waverly	633	518	626	918	281	265	36	32.8	**3,277**
	19%	16%	19%	28%	9%	8%	1%		**100%**
Lancaster County	39078	37905	74780	71283	31260	26298	4803	32.6	**285,407**
	14%	13%	26%	25%	11%	9%	2%		**100%**
Ashland	355	341	463	672	232	317	73	37	**2,453**
	14%	14%	19%	27%	9%	13%	3%		**100%**
Brainard	35	47	37	94	52	60	5	45.5	**330**
	11%	14%	11%	28%	16%	18%	2%		**100%**

Jurisdiction	< 5 - 9	10 - 19	20 - 34	35 - 54	55 - 64	65 - 84	> 85	Median	Total
Ceresco	147	124	162	262	106	80	8	35.6	**889**
	17%	14%	18%	29%	12%	9%	1%		**100%**
Valparaiso	72	83	88	164	72	82	9	41.4	**570**
	13%	15%	15%	29%	13%	14%	2%		**100%**
Lower Platte North NRD	43,072	42,077	79,280	79,885	35,238	29,909	5429		**314,890**
	14%	13%	25%	25%	11%	9%	2%		**100%**

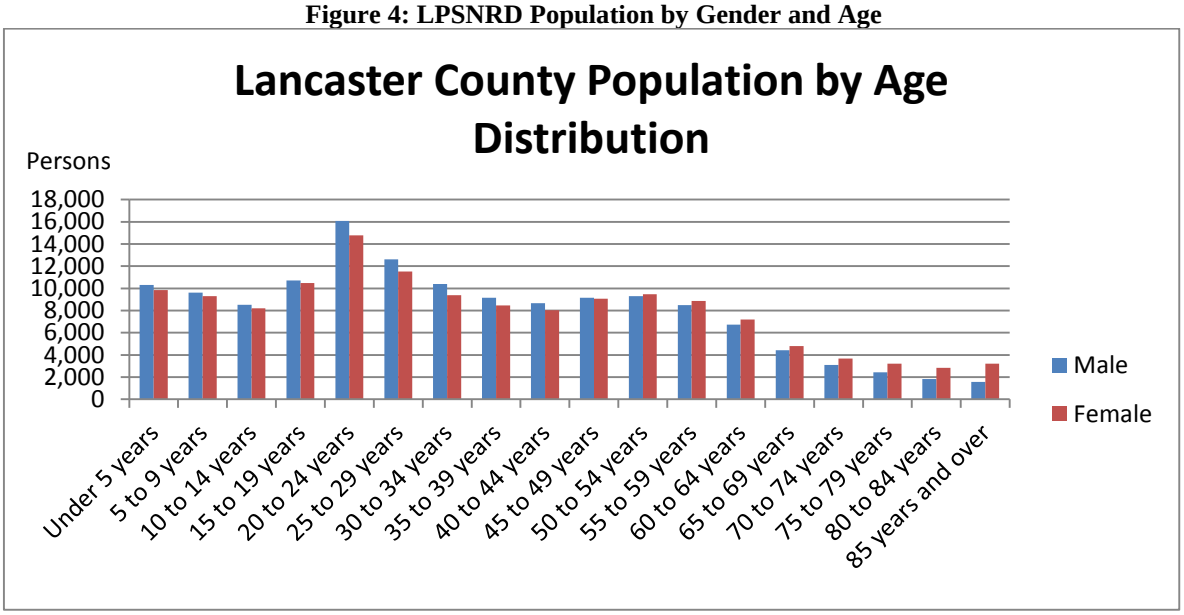
Source: United States Census Bureau – 2010

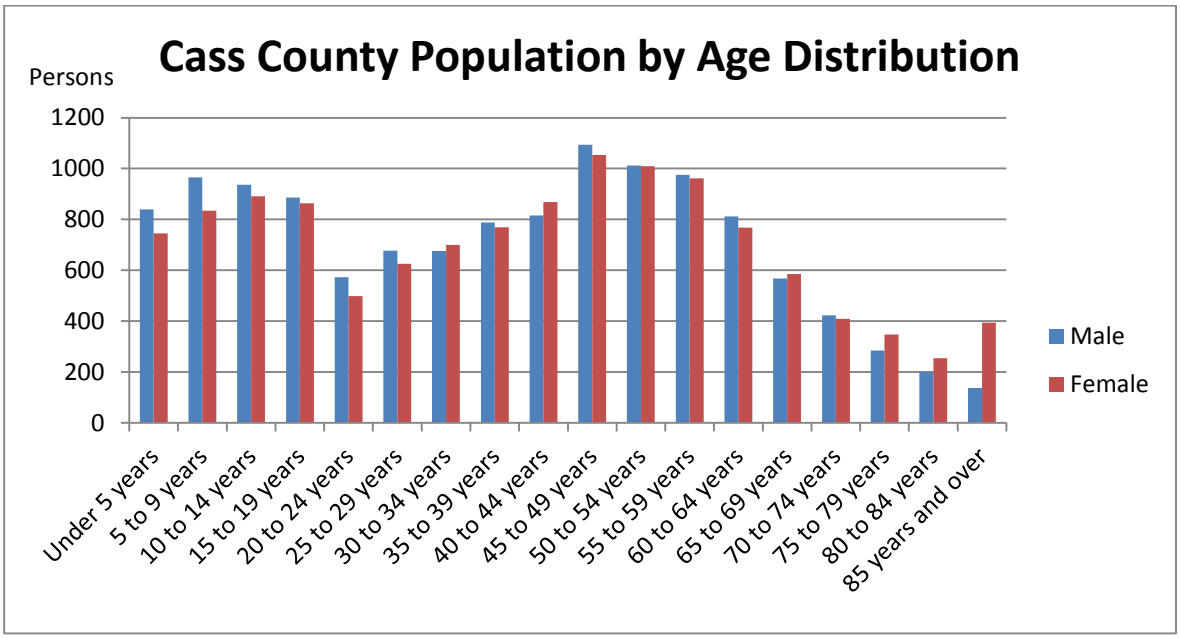
The largest age cohort of 35-54 represents 25.4% of the total population, or 79,885 persons. The smallest age cohort of 85 and older represents 2%, or 5,429 persons. Cedar Creek (25%), Brainard (20%), South Bend (19%), Firth (18%), and Murray (18%) are well above the planning area average of 11% of the population 65 and older.

The age cohorts that represent the highest levels of vulnerability, general, are those of people under the age of 19 and over the age of 65. For the planning area, more than 27%of the population is under the age of 19. This group is vulnerable to a wide range of hazards including: severe winter storms, tornado, and extreme heat. Most individuals under the age of 19 are reliant on others for transportation. Events that require evacuation or relocation (such as moving to a tornado shelter) would require transportation that may or may not be available, as they are dependent on others in the area. This demographic group is more likely to be clustered together especially during daytime hours when they are in school. An event like a tornado that impacts a school building during school hours could result in a much higher injury and/or fatality count than if this group was dispersed throughout the community. According to the American Association of Pediatricians, children of all ages are much more vulnerable to the effect of extreme heat due to a decreased ability to regulate their body temperature.

Individuals over the age of 65 constitute more than 11%of the planning area population. This demographic group also experiences higher risks related to a number of natural hazards which include: severe winter storms, tornados, severe thunder storms, and extreme heat. A 2011 study conducted by the Center for Injury Research and Policy found that on average there are 11,500 injuries and 100 deaths annually related to snow removal. People, especially males, over the age of 55 are 4.25 times more likely to experience cardiac symptoms during snow removal. Community members over the over the age of 65 have a higher rate of decreased mobility directly impacting their ability to seek shelter during extreme weather events such as severe thunderstorms or tornados. Power outages during severe thunderstorms and severe winter storms may also result in prolonged power outages resulting in negative outcomes for community members dependent on medical equipment.

Figure 4: LPSNRD Population by Gender and Age





Source: United States Census Bureau – 2010

Table 6: Housing Occupancy and Tenure

Jurisdiction	Total Housing Units				Occupied Housing Units			
	Occupied		Vacant		Owner		Renter	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Alvo	52	86.7%	8	13.3%	46	88.5%	6	11.5%
Avoca	94	87.9%	13	12.1%	80	85.1%	14	14.9%
Cedar Creek	170	54.5%	142	45.5%	153	90.0%	17	10.0%
Eagle	384	91.9%	34	8.1%	327	85.2%	57	14.8%
Elmwood	243	91.7%	22	8.3%	186	76.5%	57	23.5%
Greenwood	150	96.8%	5	3.2%	140	93.3%	10	6.7%
Louisville	477	92.6%	38	7.4%	331	69.4%	146	30.6%
Manley	66	98.5%	1	1.5%	51	77.3%	15	22.7%
Murdock	109	92.4%	9	7.6%	91	83.5%	18	16.5%
Murray	187	89.0%	23	11.0%	163	87.2%	24	12.8%
Nehawka	83	84.7%	15	15.3%	74	89.2%	9	10.8%
Plattsmouth	2525	88.2%	338	11.8%	1645	65.1%	880	34.9%
South Bend	41	87.2%	6	12.8%	31	75.6%	10	24.4%
Union	91	86.7%	14	13.3%	71	78.0%	20	22.0%
Weeping Water	427	91.6%	39	8.4%	330	77.3%	97	22.7%
Cass County	9,698	87.3%	1,419	12.7%	7,839	80.8%	1,859	19.2%
Bennet	286	93.5%	20	6.5%	243	85.0%	43	15.0%
Davey	61	92.4%	5	7.6%	52	85.2%	9	14.8%
Denton	82	95.3%	4	4.7%	59	72.0%	23	28.0%
Firth	204	93.6%	14	6.4%	141	69.1%	63	30.9%
Hallam	78	96.3%	3	3.7%	68	87.2%	10	12.8%
Hickman	587	96.4%	22	3.6%	473	80.6%	114	19.4%
Lincoln	103546	93.7%	7000	6.3%	60664	58.6%	42882	41.4%
Malcolm	143	87.2%	21	12.8%	114	79.7%	29	20.3%
Panama	90	90.0%	10	10.0%	76	84.4%	14	15.6%
Raymond	71	93.4%	5	6.6%	63	88.7%	8	11.3%
Roca	81	97.6%	2	2.4%	70	86.4%	11	13.6%
Sprague	61	96.8%	2	3.2%	51	83.6%	10	16.4%
Waverly	1113	96.6%	39	3.4%	910	81.8%	203	18.2%
Lancaster County	113,373	93.8%	7,502	6.2%	69,309	61.1%	44,064	38.9%
Ashland	951	89.7%	109	10.3%	640	67.3%	311	32.7%
Brainard	152	87.4%	22	12.6%	118	77.6%	34	22.4%
Ceresco	333	95.1%	17	4.9%	273	82.0%	60	18.0%
Valparaiso	241	87.3%	35	12.7%	196	81.3%	45	18.7%
LPSNRD	124,748	93.2%	9,104	6.8%	78,375	62.8%	46,375	37.2%

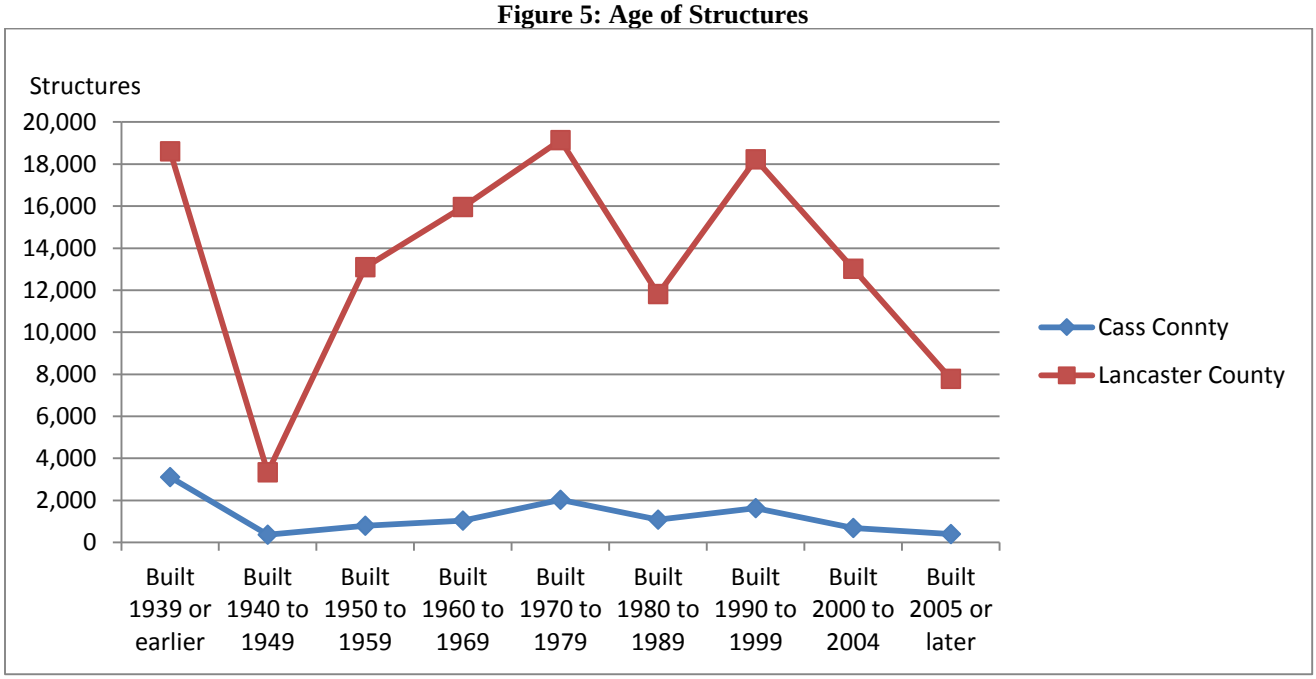
Source: United States Census Bureau, 2010

According to the US Census there are 133,852 housing units in the planning area. Nearly 45% of housing units in the planning area were constructed prior to 1970 (making the age of these units more than 40 years old). According to the Department of Housing and Urban Development (HUD), homes of this vintage are at greater risk of poor repair and dilapidation resulting in blighted or substandard properties. This is significant in assessing hazard vulnerability because these housing units may result in living quarters that are prone to higher damages during disaster events which include high winds, tornados, hail, severe thunderstorms, and severe winter storms.

For the planning area nearly 7% of housing units are vacant. Vacant housing units in a community add to vulnerability by creating structures that are poorly maintained and more likely to be derelict. During disaster events like tornados or high winds, these structures may fail and result in debris which can impact other structures as well as humans, resulting in higher damage totals and injuries or fatalities. Vacant housing units can also be a haven for criminal activity. This often results in deteriorating neighborhoods and communities. Some of the participating communities in this planning process have already identified the concern related to older building stock and revitalization efforts. Some of the participating jurisdictions have completed blight studies to help define their needs and an approach to address the concerns.

Of the occupied housing units, more than 37% are renter occupied. Renter occupied housing units often do not receive many of the updates and retrofits that are need to make them resilient to disaster impacts. Communities may consider enacting landlord outreach programs aimed at educating property owners about the threats in their area and what they can do to help reduce the vulnerability of the tenants living in their housing units. It should be noted that Lancaster County has a significantly higher percentage of renter occupied housing units than Cass County. Renter occupied housing units in Lancaster County account for 39% of housing units, while Cass County renter occupied units only comprise 19% of the housing stock. The City of Lincoln, the largest community in the planning area, has more than 40% of housing stock occupied by renters.

Figure 5: Age of Structures



Source: U.S. Census Bureau, 2010

Table 7: Selected Demographic Characteristics, Cass County

Cass County Selected Characteristics

Occupied housing units	9,770	% of Total
Lacking complete plumbing facilities	46	0.50%
Lacking complete kitchen facilities	80	0.80%
No telephone service available	132	1.40%
Mobile Homes	698	6.30%
Housing Unit with No vehicles available	356	3.60%
Population 65+ (Disability)	1,024	29.80%

Sources: United States Census Bureau – 2006-2010 American Community Survey 5-year Estimate, 2010 Census Data

Table 8: Selected Demographic Characteristics, Lancaster County

Lancaster County Selected Characteristics		
Occupied housing units	114,649	% of Total
Lacking complete plumbing facilities	207	0.20%
Lacking complete kitchen facilities	863	0.80%
No telephone service available	2,467	2.20%
Mobile Homes	2,442	2.00%
Housing Unit with No vehicles available	7,159	6.20%
Population 65+ (Disability)	10,202	33.70%

Sources: United States Census Bureau – 2006-2010 American Community Survey 5-year Estimate, 2010 Census Data

The selected housing characteristics include housing units that lack complete plumbing or kitchen facilities, have no telephone service, or are mobile homes. Overall, less than 1% of the housing units in the planning area lack plumbing or kitchen facilities. The lack of these facilities may result in increased vulnerability if efforts to accommodate these deficiencies result in unsafe and/or dangerous living conditions such as cooking on hotplates or over open fires. These types of activities could result in urban fires in some situations. Approximately 2% of housing units lack access to landline telephone service. This does not necessarily indicate there is not phone in the housing unit, as cellular telephones are increasingly a primary form of telephone service. However, this lack of access to landline telephone service does represent a population at increased risk to disaster impacts. Reverse 911 systems are designed to contact households via landline services and as a result, some homes in hazard prone areas may not receive notification of potential impacts in time to take protective actions. Nearly 2.5% of housing units in the planning area are mobile homes. Mobile homes are at a higher risk of sustaining damages during high wind events, tornados, severe thunderstorms, and severe winter storms. Mobile homes that are either not anchored or are anchored incorrectly can be overturned by 60 mph winds. Many of the zoning regulations addressed the anchoring of mobile homes. A thunderstorm is classified as severe when wind speeds exceed 58mph, placing improperly anchored mobile homes at risk.

Tables 7 and 8 also show the disability status of the civilian non-institutionalized population of age 65 and older. This information, along with the low to moderate income percentage of the planning area (38%), conveys the vulnerabilities of this jurisdiction to the effects of all hazards listed in the plan. These demographic groups can be more vulnerable to hazard events due to decreased mobility and few resources and options for implementing mitigation strategies.

RURAL WATER DISTRICTS

There are many sparsely populated rural areas in Nebraska. Many residents in these areas are served by Rural Water Districts (RWDs) for their water supply. These special districts own, operate, and maintain complex 'long pipe' distribution systems. For the 2014 LPSNRD HMP, two RWDs opted to participate in the planning

process. Table 9 shows the percent change in these districts measured by number of meters (the most appropriate method per management at the RWDs). Both the RWDs in Cass County experienced an increase in total number of meters from 2008 to 2013 while the RWD in Lancaster County experienced a slight decline in meters.

Table 9: Growth Trends in the Rural Water Districts

Jurisdiction	2008 Population by Meter	2013 Population by Meter	% Change
Cass County Rural Water District #1	1,200	1,228	2.33%
Jurisdiction	**2008 Population by Meter**	**2013 Population by Meter**	**% Change**
Cass County Rural Water District #2	653	735	12.56%
Lancaster County Rural Water District #1	1,500	1,450	-3.33%

Source: Rural Water Districts

NATIONAL HISTORIC REGISTRY

According to the National Register of Historic Places, below is a summary list of the historic sites located within the planning area.

Table 10: National Historic Registry

County	Building	District	Site	Structure
Butler (Brainard)	0	0	1	0
Cass	14	4	5	1
Lancaster	83	8	4	5
Saunders (Ashland, Ceresco, Valparaiso)	5	1	0	1

Source: Nebraska National Register

FEDERAL AND/OR STATE PROPERTIES

There are a considerable number of state and federal agencies located within the planning area due to the Nebraska state capital being located in the LPSNRD. Many of these agencies are located in the Centennial Mall building. In total there are 24 state and federal buildings located in the planning area. Many of these facilities also have plans in place related to specific risks and hazards that they face.

In addition to the regular governmental buildings located in the planning area, the city of Lincoln is also home to the University of Nebraska's main campus. The University of Nebraska – Lincoln was established in 1869. Currently the University has an enrollment of 24,445. The university has set a goal of increasing enrollment to 30,000 by 2017.

The campus for the University of Nebraska – Lincoln is divided between the "city campus" and "east campus". The city campus is more active than east campus, with more structures and a higher concentration of students, staff, and faculty. The University of Nebraska participated in the planning process and was represented on the planning team by the Emergency Preparedness Coordinator. The University has more than 130 structures in the planning area, but did not provide a specific inventory or evaluation for those structures for the purpose of this plan. The following maps were taken from the Master Plan for the University of Nebraska – Lincoln, which was adopted in 2013. These maps show buildings by use, as well as buildings on the city campus located in the floodplain. Currently the University has one dorm, one dining hall, printing services, landscape services, and the Devaney Center all located in the 1% annual flood risk area. Recently work was completed on the Antelope Valley Parkway which reduced some of the flooding threat for these structures.

Figure 6: University of Nebraska City Campus

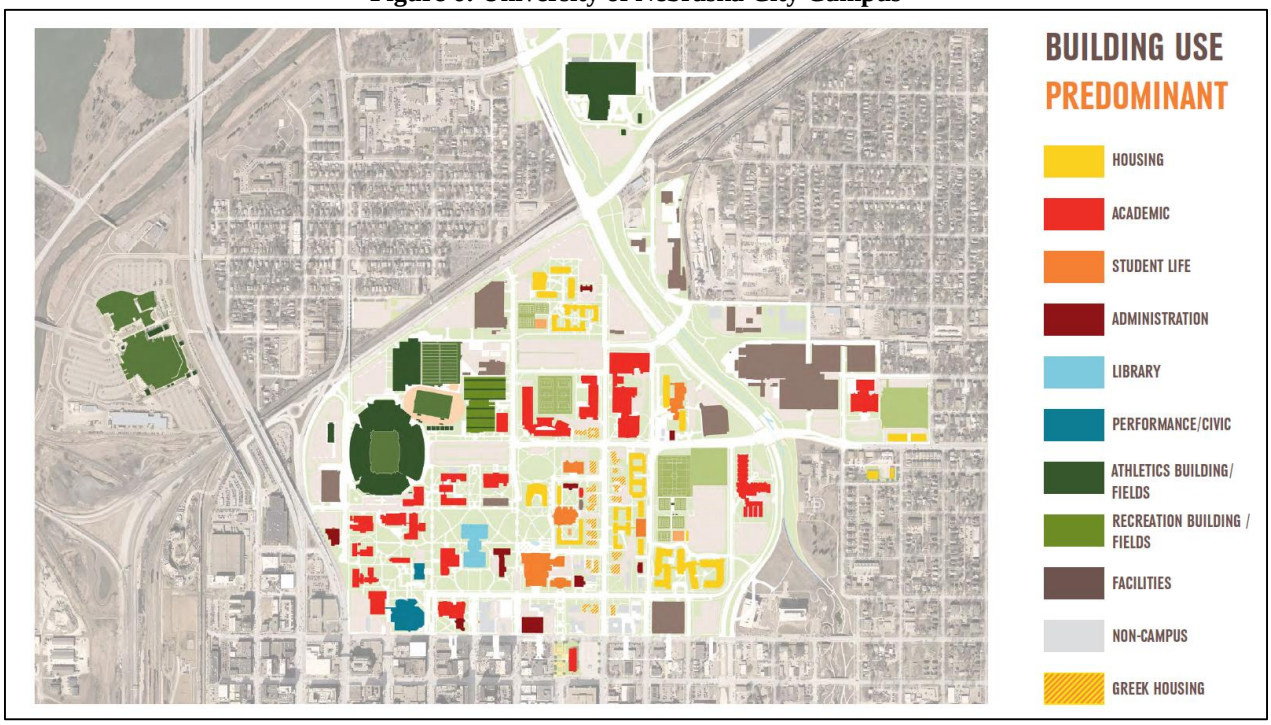


Figure 7: University of Nebraska City Campus Floodplain

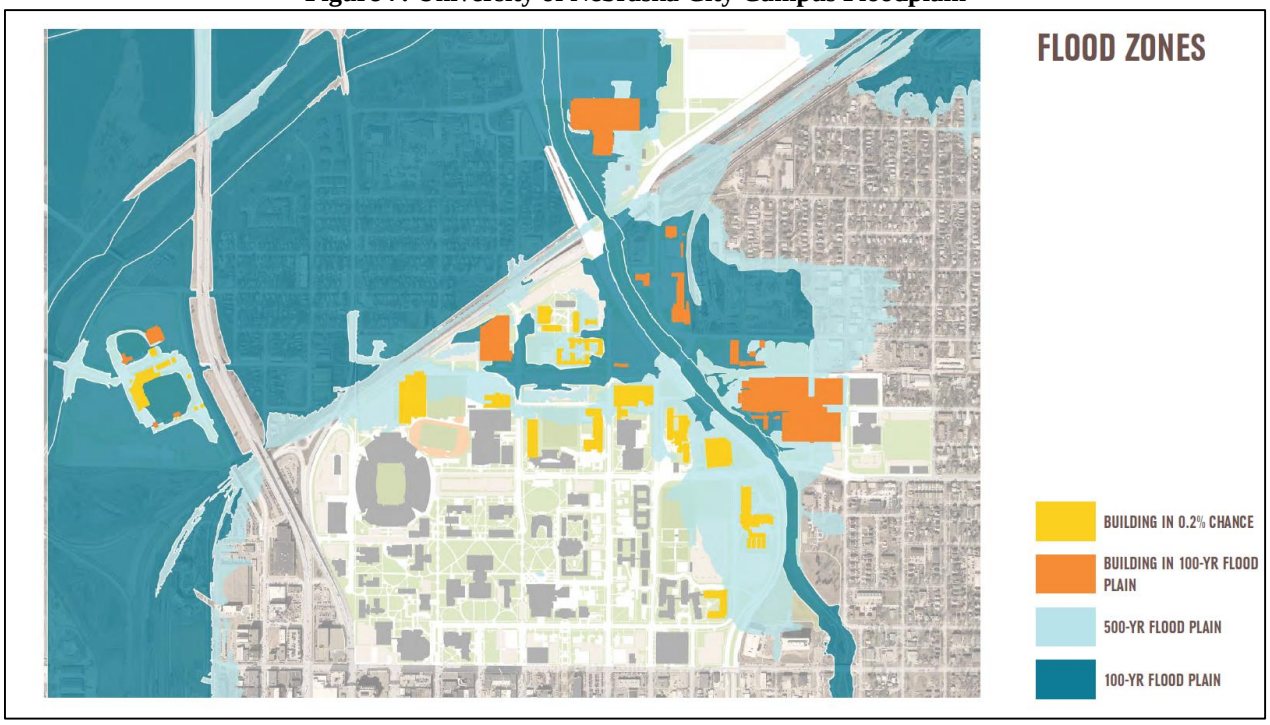
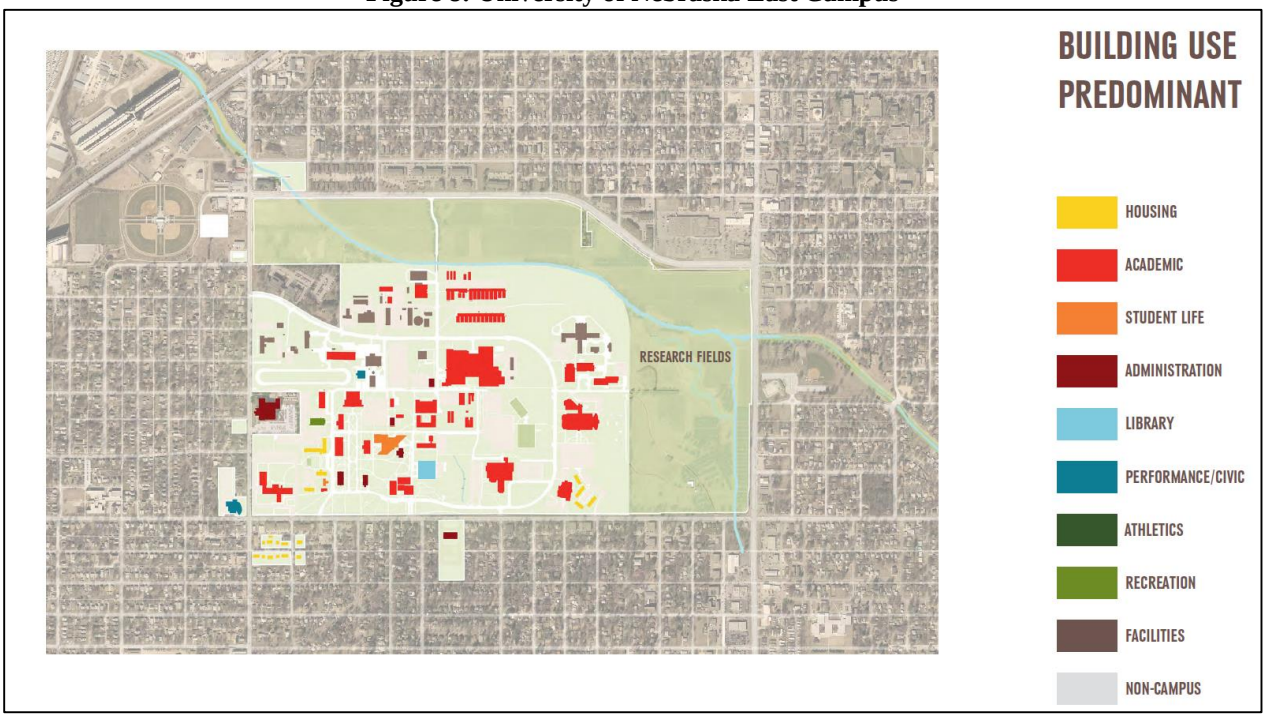


Figure 8: University of Nebraska East Campus



Source: University of Nebraska Master Plan

CRITICAL INFRASTRUCTURE AND KEY RESOURCES (CIKR)

DHS defined critical infrastructure as "assets, systems, and networks, whether physical or virtual, so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof".

According to FEMA, "A critical facility is a structure that, if flooded [or damaged], would present an immediate threat to life, public health, and safety." Examples of CFs include hospitals, Emergency Operation Center (EOC), schools, wells, and sanitary sewer lift stations, etc.

Each participating jurisdiction identified CFs vital for disaster response, providing shelter to the public, and essential for returning the jurisdiction's functions to normal during and after a disaster. CFs were updated at the 'mitigation alternative' public meetings through the meeting worksheets (refer to *Appendix C*). Table 11 is a summary of law enforcement, fire departments, and emergency management facilities for the entire planning area.

Table 11: Critical Facilities

Law Enforcement, Fire Departments, and Emergency Management Facilities			
Community	**Law Enforcement**	**Fire Department**	**Emergency Management**
Alvo	0	1	0
Avoca	0	1	0
Cedar Creek	0	1	0
Eagle	0	1	0
Elmwood	0	1	0

Community	Law Enforcement	Fire Department	Emergency Management
Greenwood	0	1	0
Louisville	0	1	0
Manley	0	1	0
Murdock	0	1	0
Murray	0	1	0
Nehawka	0	1	0
Plattsmouth	2	1	1
Union	0	1	0
Weeping Water	0	1	1
Cass County	2	14	2
Bennet	0	1	0
Firth	0	1	0
Hallam	0	1	0
Hickman	0	1	0
Lincoln	3	18	1
Malcolm	0	1	0
Raymond	0	1	0
Waverly	0	1	0
Lancaster County	3	25	1
Ashland	1	1	0
Brainard	0	1	0
Ceresco	0	1	0
Valparaiso	0	1	0
LPSNRD	5	43	3

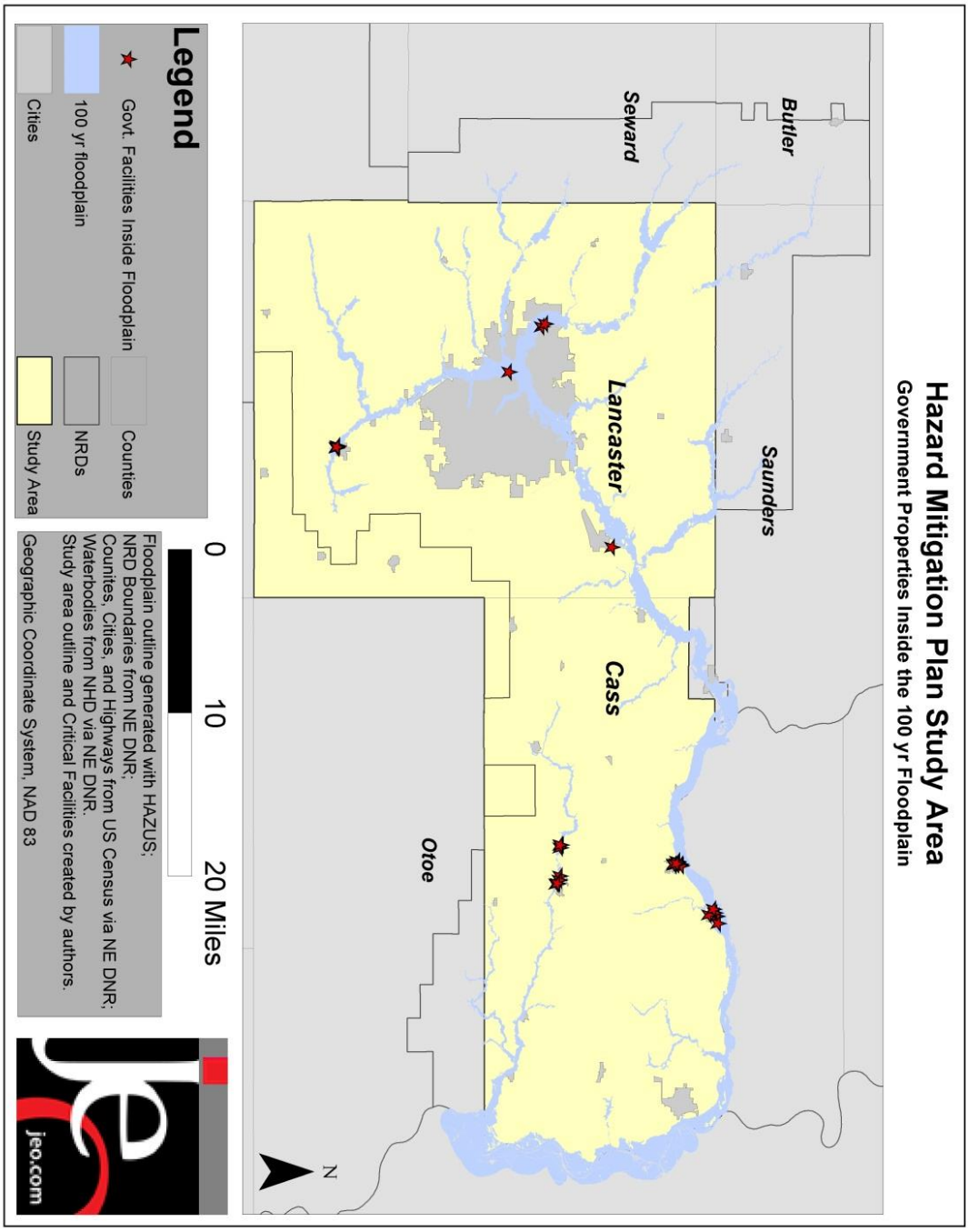
Table 12 shows the CFs summary for the whole planning area; for a list and map of CFs for participating jurisdictions please refer to *Section Seven: Participant Sections*.

Table 12: LPSNRD Critical Facilities Summary

CF (Infrastructure)	# Identified	CF (Facility)	# Identified
Municipal Well	31	Church	73
Water Tower	22	Fire Hall/Station	43
Lift Station	12	Educational	48
Pump House	7	Hospital/Clinic	10
Water Plant/Lagoon	27	Maintenance Building	22
CF (Facility)	**# Identified**	Nursing Home/Child Care Center & Homes/Preschool	583
Public Power District	10	Emergency Siren	5
American Legion	10	Gas Station	1
Storage Building	12	COOP	2
County/City Building	15	Jail/911 Center/Police	13
Utility Department	12	Community Center/Hall	34

CF (Facility)	# Identified	CF (Facility)	# Identified
Communication/Cell Tower	5	Major Employer	19
Substation	1	Pool	4
Dam/Levee	3	Park/Ball Field	28
Shelter	5	Post Office	6

Figure 9: Government Properties inside the 100-Year Floodplain



Structural Inventory

A structural inventory was completed for the corporate limits of each incorporated jurisdiction in the planning area. Structural inventories were completed in order to determine the types and numbers of structures within each jurisdiction. This inventory provided valuable information on the vulnerability and potential losses to each plan participant.

Structural inventory data was collected from county assessors who were able to provide a data set which includes location of property, zoning for properties (in Cass and Lancaster Counties only), parcel value, and value for improvements (structures). This information was used for assessing risk to structures related to hazards with known geographic locations such as flooding.

Structures are categorized into the following classifications:

- **Residential**, including all residential structures: single-family dwellings, multi-family dwellings (duplexes, townhomes, and apartments), trailer homes, and retirement villages. High-Density Residential buildings, such as apartment buildings, were also identified. In this process, these were treated as residential structures.
- **Commercial/Industrial**, including all structures associated with commercial or industrial uses, such as motels, restaurants, gas stations, storage facilities, hair salons, manufacturing facilities, grain elevators, etc.
- **Public/Quasi Public**, including structures that are a part of any government facility, religious facility, non-profit organization, or community facility, such as post offices, county buildings, courthouses, city halls, fire stations, schools, churches, water treatment facilities, park facilities, etc.
- **Agricultural**, including buildings used solely for agricultural purposes in which the use is exclusively in connection with the production, harvesting, storage, drying, or raising of agricultural commodities, including the raising of livestock.
- **Others**, including those structures which are on the property but cannot be classified as all previous types of structures; these structures may include but are not limit to detached garages, storage sheds, swimming pools, and retaining walls.

HAZUS-MH

HAZUS-MH is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. It uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters.

HAZUS is used for mitigation and recovery as well as preparedness and response. The software has been widely applied by governments in the U.S. as well as emergency management organizations worldwide. Based on the hazard risk assessment and information available for analysis, only 1% flood events were simulated in the region using HAZUS-MH to predict potential losses. Refer to Flood in *Section Four: Risk Assessment* for further information regarding HAZUS-MH analysis.

STRUCTURAL INVENTORY AND VALUATION SUMMARY

Table 13 displays the structural inventory and evaluation summaries for both the cities and counties in the planning area.

Table 13: Structural Inventory and Valuation Summary

Jurisdiction	Commercial/ Industrial		Agricultural		Residential		Other		Total	
	#	Value	#	Value	#	Value	#	Value	#	Value
Cass County	988	$187,462,530	1,683	$46,211,850	6,613	$1,577,158,213	5,223	$8,143,524	14,507	$1,818,976,117
Lancaster County	6,932	$5,106,610,580	7,327	$39,870,300	79,303	$13,598,816,168	43,260	$20,434,113	136,822	$18,765,731,161
LPSNRD	7,920	$5,197,494,004	9,010	$1,022,173,653	85,916	$9,703,901,941	48,483	$8,376,430,402	151,329	$24,300,000,000

Source: Lancaster & Cass County Assessor Data
**Denotes communities located in Butler and Saunders Counties. The county assessor's offices for these jurisdictions do not differentiate different uses (i.e. residential, agricultural, commercial, etc.). As a result the structural inventory does not provide a break down by use.*

Climate Summary

Located on the Great Plains far from the moderating influence of mountains or large bodies of water, the planning area possesses a highly variable four-season humid continental climate: winters are cold, but relatively dry; springs are generally warm with a regular wind; summers are hot and humid; and fall is generally pleasant but can produce an early season snow event. With little precipitation falling during winter, precipitation is concentrated in the warmer months, when thunderstorms frequently roll in, often producing tornados. Snow tends to fall in light amounts, though blizzards are possible. Snow cover is not very reliable due to both the low precipitation and the frequent thaws during winter.

The monthly daily average temperature ranges from 24.6 °F (−4.1 °C) in January to 77.6 °F (25.3 °C) in July. However, the planning area is subject both to episodes of bitter cold in winter and heat waves during summer, with 11.4 nights of sub-0 °F (−18 °C) lows, 41 days of 90 °F (32 °C)+ highs, and 4.6 days of 100 °F (38 °C)+ highs. The planning area straddles the boundary of USDA Plant Hardiness Zones 5b and 6a, indicating an annual minimum temperature of around −10 °F (−23 °C). Temperature extremes have ranged from −33 °F (−36 °C) on January 12, 1974 up to 115 °F (46 °C) on July 25, 1936.

Farm Service Agency: SBA Declared Disasters

The U.S. SBA was created in 1953 as an independent agency of the federal government to aid, counsel, assist, and protect the interests of small business concerns, to preserve free competitive enterprise, and maintain and strengthen the overall economy of our nation. A program of the SBA includes disaster assistance for those affected by major natural disasters. Table 14 summarizes the SBA Disasters involving the planning area.

Table 14: Farm Service Agency SBA Disasters

Declared	Disaster Number	Description and Documents	Primary Counties	Contiguous Counties
4/10/2013	NE-00053	Drought	Multiple (Butler, Lancaster, Otoe, Saunders)	Multiple
1/9/2013	MO-00060	Drought	Multiple	Multiple (Otoe)
8/22/2012	NE-00052	Drought, Excessive Heat, and High Winds	Multiple	Multiple (Lancaster, Otoe)
8/8/2012	NE-00050	Drought	Multiple (Saunders)	Multiple (Cass, Lancaster)

Source: United States SBA

Presidential Disaster Declarations

The presidential disaster declarations involving the planning area up until May 2014 are summarized in Table 15. Declarations prior to 1962 are available on the FEMA website, but do not list designated counties.

Table 15: Presidential Disaster Declarations in the Last Decade

Disaster Declaration Number	Declaration Date	Disaster Type	Total Individual Assistance	Public Assistance Counties	Total Public Assistance Grants
DR-4013	Aug 12, 2011	Flooding	$4,311,497	Multiple (Cass, Otoe)	$84,907,462
DR-1945	Oct 21, 2010	Storms, flooding, Tornado, and Straight-line Winds	$0.00	Multiple (Cass, Otoe, Saunders)	$2,132,220
DR-1924	Jul 15, 2010	Severe Storms, Flooding, and Tornados	$0.00	Multiple (Cass, Otoe)	$50,535,460
DR-1902	Apr 21, 2010	Severe Storms, Ice Jams, and Flooding	$0.00	Multiple (Cass, Lancaster, Otoe)	$3,145,009

Disaster Declaration Number	Declaration Date	Disaster Type	Total Individual Assistance	Public Assistance Counties	Total Public Assistance Grants
DR-1878	25-Feb-10	Severe Winter Storms and Snowstorm	$0.00	Multiple (Cass, Lancaster, Otoe, Saunders)	$6,500,912
DR-1770	20-Jun-08	Severe Storms, Tornados, and Flooding	$1,560,229	Multiple (Cass, Lancaster, Otoe, Saunders)	$36,258,650
DR-1706	6-Jun-07	Severe Storms, Flooding, and Tornados	$0.00	Multiple (Cass, Otoe, Saunders)	$6,109,252
DR-1517	25-May-04	Severe Storms, Tornados, and Flooding	$829,908	Multiple (Cass, Lancaster, Otoe)	$13,351,657

Source: FEMA

Capability Assessment

The capability assessment for the LPSNRD plays a significant role in the overall planning process and lays part of the foundation for developing effective and implementable hazard mitigation strategies. The capability assessment utilized for this update assisted in the identification of what resources are currently available within participating jurisdictions. Areas considered include: administrative; funding and grant experience; planning and regulatory; and education and community involvement.

This section examines the capabilities at the regional, state, and federal level that significantly contribute to mitigating the impacts of natural and man-made hazards. Specific information for each jurisdiction is later demonstrated in *Section Seven: Participant Sections*.

REGIONAL (NATURAL RESOURCE DISTRICT (NRD)) CAPABILITY

Nebraska's system of local natural resources management is unique in the United States. Unlike the county-wide districts found in most states, Nebraska's NRDs are based on river basin boundaries, enabling them to approach natural resources management on a watershed basis. Like the other 22 NRDs in Nebraska, LPSNRD is autonomous, governed by a locally–elected Board of Directors. While NRDs share a common set of responsibilities, each district sets its own priorities and develops its own programs to serve local needs. In general, NRDs are charged under state law with 12 areas of responsibility:

- Erosion prevention and control
- Prevention of damages from flood water and sediment
- Flood prevention and control
- Soil conservation
- Water supply for any beneficial uses
- Development, management, utilization, and conservation of groundwater and surface water
- Pollution control
- Solid waste disposal and drainage
- Drainage improvement and channel rectification
- Development and management of fish and wildlife habitat
- Development and management of recreational and park facilities
- Forestry and range management

LPSNRD takes the lead on a variety of projects that fulfill the responsibilities required by the state law. The most recently completed projects include Bank Stabilization, Salt Creek Levee Project, Flood Control Watershed Project Dams, Antelope Valley Flood Control Project, Flood Control Non-Watershed Project Dams, Stream Interventions, and Trails/Conservation Corridors. The NRD also offers educational programs, cost-shares with landowners to conserve, and establishes many other programs for the protection of natural resources.

In addition to taking the lead in hazard mitigation planning, the NRD also developed plans for water resources, stormwater management, and emergency actions. Selected plans that are related to hazard mitigation are briefly described below, with more information available at the LPSNRD official website (www.lpsnrd.org).

LPSNRD Master Plan & Long Range Implementation Plan
The Master Plan, which was updated in 2009, will be in effect for a period not to exceed ten years. It serves as a broad framework for district activities. The Long Range Implementation Plan, which was updated in 2013, serves as an implementation tool of the Master Plan. It lists annual programs enacted to achieve the current visions, desired outcomes and objectives of the Master Plan. Components of this plan which relate to hazard mitigation include: Sustainable Water Resources, Low Impact Developments, Minimal Flood Threat and Damage, and Protection of Natural and Unique Resource Areas.

LPSNRD Integrated Management Plan
This plan is in progress, and is intended to develop a comprehensive inventory of all available ground and surface water supplies and all current water uses, a projection of future water use needs and identification of potential sources, and desired management of conservation programs.

Emergency Action Plans
Emergency action plans for certain dams in the District in case of flooding, earthquakes, or other similar hazards are kept and administered by the NRD as required by Federal regulations.

STATE CAPABILITY
NEMA
NEMA is a small agency with less than 40 full and part-time employees and is a part of the Military Department in the State of Nebraska. NEMA is responsible for emergency management, which is usually divided into four phases: preparedness, response, recovery, and mitigation.

NEMA's role related to mitigation includes (but is not limited to) developing the state hazard mitigation plan, this plan serves as a comprehensive set of guidelines for hazard response across the state. The state hazard mitigation plan frames the discussion that will be conducted at the local level related to relevant hazards and needs across the state. The state hazard mitigation officer and other mitigation staff members play an active role in assisting in the development of local hazard mitigation plans. Representatives from the state hazard mitigation program serve as a technical guide to local planning teams and regularly participate in local mitigation planning meetings. The state hazard mitigation program also oversees the Hazard Mitigation Grant Program (HMGP) and works with the Governor's taskforce to prioritize projects requesting funding assistance through the HMGP.

The main objective in NEMA's preparedness process is to develop plans and procedures to help facilitate any response that may need to occur during a hazard event. NEMA assists communities in the development of county or city/village planning documents; assists with the development of exercises for existing plans and procedures; conducts trainings for communities officials, assist emergency management related groups (Citizen Emergency Response Teams, Citizen Corps, Medical Reserve Corps, Fire Corps, and other interest groups); and provide technical resources and expertise throughout the state.

NEMA's role during a response is to assist communities in responding to hazard events when the need for assistance exceeds the local capabilities and resources. This includes facilitating and tracking grants, coordinating local needs, providing state and federal level assistance through activation of EOC, Mass Critical Shelters, Emergency Alert Systems (EAS) and providing technical, logistical, and administrative resources and expertise before, during, and after incidents. The main purpose of the recovery phase is to perform actions that allow the return of normal living, or better conditions, which may include vital life saving measures. The secondary role of the recovery phase is grant administration and tracking, project monitoring, damage assessment, collaborating with communities on effective recovery options and opportunities, serving as liaison

between federal level entities and local representatives, and serving as a technical resource throughout the recovery process.

For more information regarding the plans and NEMA's responsibilities as well as their ongoing projects, please go to http://www.nema.ne.gov.

NDNR

The NDNR is committed to providing Nebraska's citizens and leaders with the data and analyses they need to make appropriate natural resource decisions for the benefit of all Nebraskans both now and in the future. The state agency is responsible in the area of surface water, groundwater, floodplain management, dam safety, natural resource planning, integrated water management, storage of natural resources and related data, and administration of state funds.

NDNR plays a significant role in protecting and conserving water resources through the oversight of surface and groundwater status and integrated water management. The NDNR is also responsible for a non-structural program of floodplain management, coordination and assistance with the NFIP as well as the FMA, reviewing and approving engineering plans for new dams, rehabilitating old dams, and high hazard dam emergency preparedness plans. NDNR was very active throughout the hazard planning process and provided extensive resources and technical support for hazard risk and vulnerability analysis such as flood and dam failure. NDNR also works with communities in many capacities including assisting in the completion of Benefit Cost Analysis (BCA).

For more information regarding NDNR's responsibilities as well as their ongoing projects, please go to http://dnr.ne.gov/

CARC

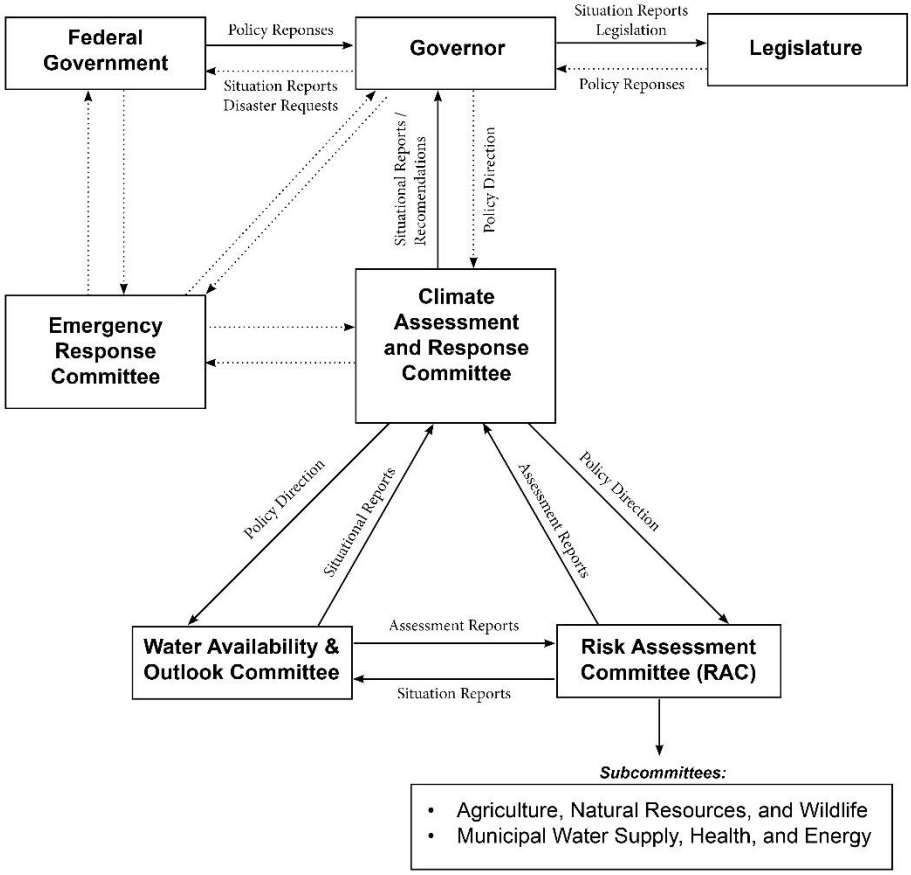
Nebraska's Climate Assessment and Response Committee (CARC) was established by the Nebraska Legislature in 1991 and serves as the major drought planning and response committee in state. The committee's duties are:

- To provide timely and systematic data collection, analysis, and dissemination of information about drought and other severe climate occurrences to the Governor and to other interested persons.
- To provide the Governor and other interested persons with information and advice relevant to requests for federal disaster declarations and to the use of funds and other types of assistance available to the state because of such declarations.
- To establish criteria for startup and shutdown of various assessment and response activities by state and federal agencies during drought and other climate-related emergencies.
- To provide an organizational structure that assures information flow and defines the duties and responsibilities of all agencies during times of drought and climate-related emergencies.
- To maintain a current inventory of state and federal agency responsibilities in assessing and responding to drought and other climate-related emergencies.
- To provide a mechanism for the improvement of methods of assessing impacts of drought on agriculture and industry.
- To provide such other coordination and communication among federal and state agencies as is deemed appropriate by such committee.
- To perform such other climate-related assessment and response functions as are desired by the Governor.

CARC also coordinated with other state and federal agencies to develop a State Drought Mitigation and Response Plan. The committee serves as a steering role for the state's drought plan and other climate-related activities. As shown in Figure 10, the other principal committees associated with CARC are the Water Availability and Outlook Committee (WAOC) and the Risk Assessment Committee (RAC). To avoid any overlap of duties, originally considered as a formal arm of CARC, Emergency Response Committee (ERC) was

revised in June 2000 and its role was folded into the NEMA organization and separated from the official CARC structure.

Figure 10: Organizational Components of Nebraska's CARC



Source: http://carc.nebraska.gov/

Other Key Agencies

Other agencies that play an active role in hazard mitigation planning and contribute to the overall planning process at the state level are shown in Table 16. Members from these agencies were designated as the Governors' Task Force for Disaster Recover (GTFDR) and served as the planning team responsible for coordinating the development of the 2011 Nebraska HMP[1].

Table 16: Other Key Agencies in the State of Nebraska

Agency	Official Website Link
Nebraska Department of Agriculture (NDA)	http://www.nda.nebraska.gov/
Nebraska State Patrol	https://statepatrol.nebraska.gov/
Nebraska Department of Economic Development	http://www.neded.org/
Nebraska Department of Environmental Quality (NDEQ)	http://www.deq.state.ne.us/
Nebraska Game and Parks Commission	http://outdoornebraska.ne.gov/
Nebraska Historical Society	http://www.nebraskahistory.org/
Nebraska Department of Administrative Services	http://das.nebraska.gov/
Nebraska Department of Revenue	http://www.revenue.ne.gov/

[1] The State of Nebraska Hazard Mitigation Plan (2014) is now available, but it was not available at the time of the planning process.

Nebraska Department of Health and Human Services	http://dhhs.ne.gov
Nebraska Forest Service	http://nfs.unl.edu/
Nebraska Public Health Laboratory – UNMC	http://www.unmc.edu/pathology/
University of Nebraska – School of Natural Resources	http://snr.unl.edu/

The Silver Jackets program is also worth mentioning for their extensive role in providing a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards. It brings together multiple state, federal, and sometimes tribal and local agencies to learn from one another and apply their knowledge to reduce risk. Currently the Silver Jackets are working with communities in Cass County, reviewing nonstructural flood protection options. The report is expected to be completed in 2014 and should be included in future updates for this plan. Please go to http://www.nfrmp.us/state/ for details about the Silver Jackets and the work they are doing in Nebraska.

FEDERAL ASSISTANCE

The federal government and its sub-agencies have provided a variety of assistance for state and local governments in hazard mitigation planning and emergency response. The table below lists the major federal agencies and summarizes their major types of assistance. For more information regarding funding opportunities, please refer to Table 17.

Table 17: Major Federal Assistant Agencies

Agency	Type of Assistance	Official Website Link
DHS/ FEMA	Administrative, Political, Funding, Educational, and Technical	http://www.fema.gov/
NOAA	Educational and Technical	http://www.noaa.gov
U.S. Department of Agriculture	Funding, Educational, and Technical	http://www.usda.gov
U.S. Geological Survey	Educational and Technical	http://www.usgs.gov
U.S. Environmental Protection Agency	Educational and Technical	http://www.epa.gov
U.S. HUD	Administrative, Educational, and Technical	http://portal.hud.gov
U.S. SBA	Funding	http://www.sba.gov
U.S. Department of Transportation	Funding, Educational, and Technical	http://www.dot.gov/
U.S. Department of Health and Human Services	Funding, Educational, and Technical	http://www.hhs.gov

Section Four: Risk Assessment

Regional Risk Assessment

Weather itself is not a hazard. However, one weather event often creates multiple hazards. For example, a single severe thunderstorm event may cause flooding, tornados, or wildfires from lightning. Man-made hazards, such as prolonged power outages, can also be linked to the incidence of weather events, but they may also occur under normal daily conditions.

The methodology utilized for the regional risk assessment varies by hazard, depending upon the information available. It consists of the following components: historical occurrences; estimated probability of future occurrences; the calculation of Average Annual Damages for those hazards where sufficient data was available; the identification of assets located within high risk areas such as the floodplain, for those hazards which can be spatially defined; and, measures of extent. The specific methodology utilized for each hazard is defined in the specific hazard sections.

The data source utilized for individual hazards varies based on the best and most appropriate source of information. The NCDC and RMA was utilized for many of the natural hazards, but it should be noted that these sources are not an all-inclusive, or exhaustive, source for historical hazard data. Often data records for short-term local hazard events are more detailed and readily accessible than data for long-term regional events.

The following table provides an overview of the data contained in the hazard profiles. This table is intended to be a quick reference for people using the plan and does not contain source information; source information and full discussion of individual hazards are included in this section. Hazards within Table 18 are listed in the order they are addressed in this plan.

- *Historical Occurrence*
  - This is reported as the number of events recorded during a defined time period. A variety of sources were utilized for this measure. A variety of sources were utilized for this measure, however, for any one hazard, a single "best" source is identified and used as a basis for analysis.
- *Probability*
  - For this plan, probability is established based on the historic record for each event. The number of reported events divided by the number of years of record yields a probability of annual occurrence. It should be

***Requirement §201.6(c)(2)**: Risk assessment. The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

***Requirement §201.6(c)(2)(i)**: [The risk assessment shall include a] description of the type … of all natural hazards that can affect the jurisdiction.*

***Requirement §201.6(c)(2)(i)**: [The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*

***Requirement §201.6(c)(2)(ii)**: [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.*

***Requirement §201.6(c)(2)(ii)**: [The risk assessment] must also address NFIP insured structures that have been repetitively damaged floods.*

***Requirement §201.6(c)(2)(ii)(A)**: The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and CF located in the identified hazard area.*

***Requirement §201.6(c)(2)(iii)**: For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

noted that this predictive method is limited in that it does not consider changes in environment, changes in climate, or efforts undertake to reduce the potential of future occurrence. When changes related to occurrence have the potential to effect deviation from the historic record, those changes will be discussed as part of the hazard profile.

- *Extent*
  - Extent is a measure of strength or magnitude of the hazard. Extent can be described in a combination of ways depending on the hazard. Standard measures for extent will be utilized when possible.
  - A variety of sources were utilized for this measure. The individual data sources utilized will be identified in the hazard profile.

Table 18: Regional Risk Assessment Summary

Regional Risk Assessment			
Hazard	**Previous Occurrence Events/Years**	**Annual Probability**	**Likely Extent**
Severe Winter Storms	87/17	100%	.25 - .5” ice 20 - 40°F below zero (wind chills) 4 – 8” snow 25 – 40 mph winds
Tornados	35/17	100%	EF0
High Winds	35/17	100%	9-10 BWF
Severe Thunderstorms	180/17	100%	≥1” rainfall
Hail	340/17	100%	H4 – H9
Flooding	59/17	100%	Minor flooding**
Extreme Heat	41/1	100%	>90°
Drought	31/216*	14%	D3
Earthquakes	0/29	1%	<4.0
Grass/Wildfires	931/12	100%	<100 acres
Levee Failure	1/13	7%	No federal levees in the planning area
Dam Failure	0	1%	<5% of population in breach inundation area
Agricultural Diseases	20/1	100%	Data not available
Fixed Sites (Chemical, Radiological)	160/23	100%	Data not available
Transportation Incidents (Chemical, Radiological)	385/34	100%	9000 LGA
Terrorism	5/9	55%	Undefined
Civil Disorder	1/20	5%	Undefined
Urban Fire	1,124/1	100%	Limited (single structure fires)

*Due to the nature of drought, probability will be calculated as number of total months in drought divided by number of total month during the period of record.
**Flooding extents are defined in Table 26.

The hazards of most significant concern include tornados and high winds, severe thunderstorms, severe winter storms, flooding, and hail. These hazards were identified based upon having the highest probability of future

occurrence, impacts on population, and impacts on property. The results in Table 18 were calculated by utilizing data and historic records when possible. Each hazard addressed will cite the data source utilized and identify the timeframe examined. Information presented by the regional and local planning teams will provide the basis for the portions of the risk assessment discussing historic impacts to critical facilities and specific concerns related to future critical facility vulnerability.

Community Based Risk Assessment

Participating jurisdictions completed a risk assessment for their community/jurisdiction. The local planning teams were asked to prioritize hazards based on local occurrences and impacts. Participants were encouraged to consider: historic events; probability of future events; specific vulnerable populations; properties that may be at higher levels of risk related to hazards; potential impacts to critical facilities and critical services; and potential economic losses. The information developed during the community based risk assessment is presented in *Section Seven: Participant Sections.*

Average Annual Damages and Frequency

FEMA ***Requirement §201.6(c)(2)(ii) (B)*** suggests that when the appropriate data is available, HMPs should also provide an estimate of potential dollar losses for structures in vulnerable areas. This risk assessment methodology provides potential dollar losses for all hazards for which historic event data is available. Additional loss estimates are provided separately for those hazards for which sufficient data is available. These estimates can be found within the relevant hazard profiles.

Average annual losses from historical occurrences can be calculated for those hazards for which there is a robust historic record and for which monetary damages are recorded. There are three main pieces of data that are used throughout this formula. Each set of data has limitations that are explained as follows:

- **Total Damages in Dollars:** This is the total dollar amount of all property damages as recorded in federal, state, and local data sources. The limitation to these data sources is that dollar figures usually are estimates and often do not include all damages from every event, but rather only officially recorded damages from reported events.
- **Total Years of Record:** This is the span of years where data is available for recorded events. Vetted and cleaned up NCDC data is available for 1996 to 2013. Nebraska Forest Service has data available for wildfires from 2000 – 2012. RMA data was available from 2000 – 2013. Although some data is available back to 1950, this plan update utilizes only the more current and more accurate data available.
- **Number of Hazard Events:** This shows how often an event occurs. The frequency of a hazard event will affect how a city responds. A thunderstorm may not cause much damage each time, but multiple storms can have an incremental effort on housing and utilities. In contrast, a rare tornado can have a widespread effect on a city.

An example of the Annual Damage Estimate is as follows:

$$\textbf{Average Annual Damages } (\$) = \frac{Total\ Damages\ in\ Dollars\ (\$)}{Total\ Years\ of\ Record\ (17)}$$

$$\textbf{Annual Frequency } (\$) = \frac{Total\ Events\ Recorded (\#)}{Total\ Years\ Recorded\ (17)}$$

The hazard types identified are those found within the State of Nebraska HMP. Each hazard will be included, while those which have caused significant damages or in significant numbers are discussed in detail. It should be noted that the table below is calculated for the entire LPSNRD planning area that features all the NCDC

data including county-based and zonal. It should be noted NCDC data is not inclusive and it provides very limited information on crop losses. In order to provide a better picture of the crop losses associated with all the hazards within the planning area, crop loss information provided by RMA of the USDA was also utilized for this update of the plan. The collected data was from 2000 to 2013 and please refer to the table below for detailed information. Data for all the hazards' is not always available so that only those with available datasets are included in the following loss estimation table.

Table 19: Hazard Loss Estimation

Hazard Type	Total Property Loss[1]	Annual Property Loss [1]	Total Crop Loss[2]	Annual Crop Loss [2]
Severe Winter Storms	$19,175,000	$1,127,941	$400,000	$30,769
Tornados	$101,309,000	$5,961,000	$0	$0
High Winds	$32,000	$1882	$47,966	$2,822
Severe Thunderstorms	$3,285,400	$193,259	$0	$0
Hail Events	$3,000,000	$176,471	$1,250,000	$73,529
Flooding	$5,177,000	$304,529	$55,000	$4,230
Grass/Wildfires	$469,534[3]	$36,118	$39,535	$3041
Agricultural Diseases	N/A	N/A	$126,220	$9,709
Transportation Incidents Chemical/Radiological	$1,161,676	$35,202	$0	$0

1 Indicates the data is from NCDC (January 1996 to December 2013); 2 Indicates data is from USDA RMA (2000 to 2013); 3 Indicates Data is from NFS (2000 to 2012)

Severe Winter Storms (Severe Winter Storms and Extreme Cold)

HAZARD PROFILE

Winter storms can bring extreme cold, freezing rain, and heavy or drifting snow creating blizzards. These storms are capable of extending over large areas, potentially impacting a broad range of populations, properties, CFs, and infrastructures. Although these storm events can reach large distances, there is generally significant warning time before a severe winter storm occurs.

Extreme Cold

Along with snow and ice storm events, extreme cold can be dangerous to the well-being of people and animals. What constitutes extreme cold varies from region to region, but is generally accepted as being temperatures that are significantly lower than the average low temperature. For LPSNRD, the coldest months of the year are January, February, March, November and December. The average low for these months are all below freezing (average low for the five months 19.2°F). The average high temperatures for the months of January, February, and December are near 32°F. Record lows for the region range from -26°F in February and December, -23°F in January, and -20°F in March.

Freezing Rain

Along with snow events, winter storms also have the potential to deposit significant amounts of ice. Ice buildup on tree limbs and power lines can cause them to collapse. This is most likely to occur when ice falls in the form of rain that freezes upon contact, especially in the presence of wind. Freezing rain is the name given to rain that falls when surface temperatures are below freezing. Unlike a mixture of rain and snow, ice pellets or hail, freezing rail is made entirely of liquid droplets. Freezing rain can also lead to many problems on the roads, as it makes them slick, causing automobile accidents, and making vehicle travel difficult.

Blizzards

Blizzards are particularly dangerous due to drifting snow and the potential for rapidly occurring whiteout conditions which greatly inhibits vehicular traffic. Heavy snow is usually the most defining element of a winter storm. Large snow events can cripple an entire jurisdiction by hindering transportation, knocking down tree limbs and utility lines, and causing structural damage to buildings.

Generally, winter storms occur between the months of November and March, but may occur as early as October and as late as April. Heavy snow is usually the most defining element of a winter storm. Large snow events can cripple an entire jurisdiction by hindering transportation, knocking down tree limbs and utility lines, and causing structural damage to buildings.

EXTENT

The Sperry-Piltz Ice Accumulation Index (SPIA) was developed by the National Weather Service (NWS) to predict the accumulation of ice and resulting damages. The SPIA looks at total precipitation, wind, and temperatures to predict the intensity of ice storms. Figure 11 shows the SPIA index.

Figure 11: SPIA Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

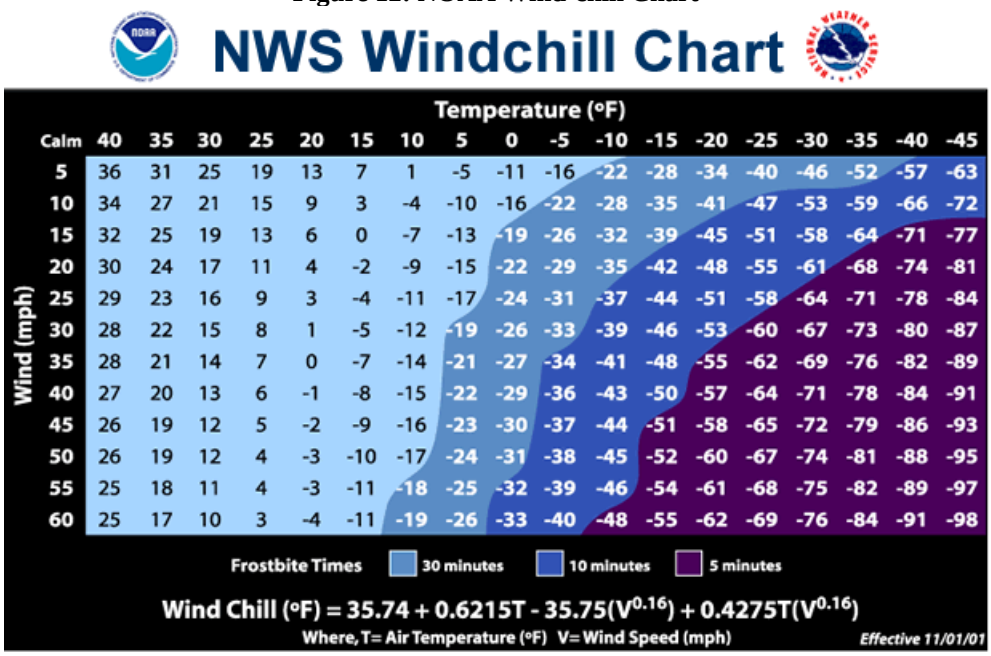
(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Source: http://www.spia-index.com/index.php

Reviews of historical severe winter storms across the planning area show that there is a range of events that can occur. Common component of winter storms in the planning area include extreme cold, ice, snow and high winds. Typical ice events correlate with Level 2 occurrences according to the SPIA Index. Ice accumulations range from a quarter of an inch to three quarters of an inch. The most common accumulation was one quarter of an inch to half an inch occurring in both ice events.

The Wind-chill Index was developed by the NWS to determine the decrease in air temperature felt by the body on exposed skin due to wind. The wind-chill is always lower than the air temperature and can quicken the effects of hypothermia or frost bite as it gets lower. Figure 12 shows the wind chill index used by the NWS.

Figure 12: NOAA Wind-chill Chart



NWS Windchill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

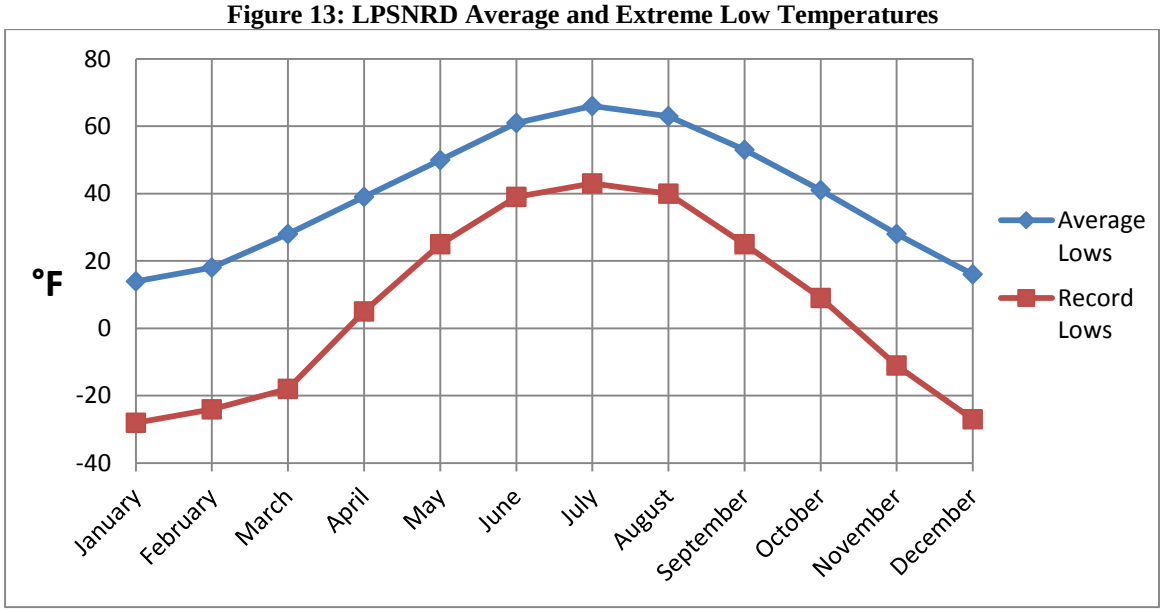
$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

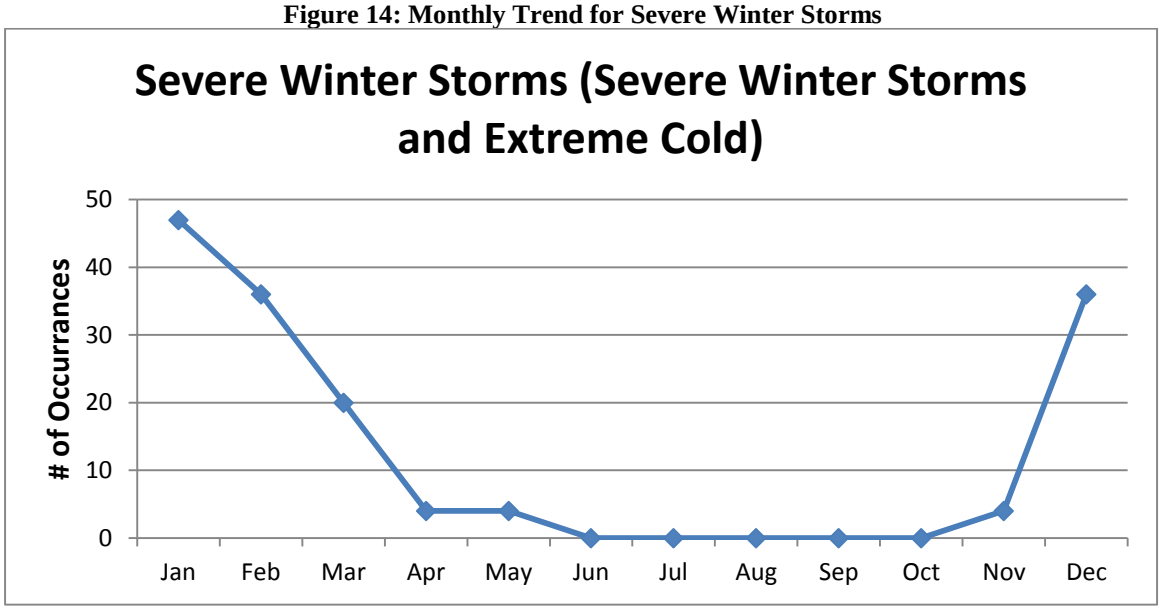
The coldest months of the year are January, February, March, November, and December and average lows for these months are generally around 20 degrees (refer to Figure 13 for regional low temperatures).

Figure 13: LPSNRD Average and Extreme Low Temperatures



Source: The Weather Channel (weather.com)

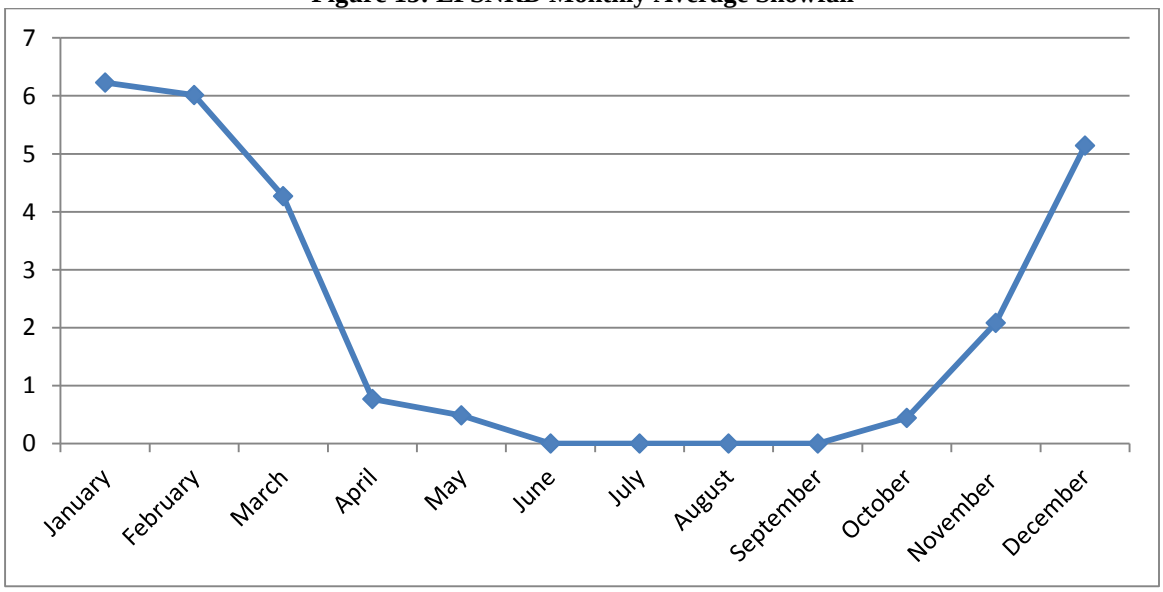
Figure 14: Monthly Trend for Severe Winter Storms



Source: NCDC

Historic snow events report accumulation between two inches and 14 inches during a twelve hour period [refer to Figure 15 for regional snow accumulation statistics reported by the weather stations located in Lincoln (254815), Lincoln Airport (254795), Raymond 2 NE (257055), Weeping Water (259090), Ashland (250375), Syracuse (258395), and Plattsmouth (256795)]. A common snow event (likely to occur annually) will result in accumulation totals between four and eight inches. Often these snow events are accompanied by high winds. It is reasonable to expect wind speeds of 25 to 40 mph with gusts reaching 60 mph or higher. Strong winds and low temperatures can combine to produce extreme wind chills of 45°F to 60°F below zero.

Figure 15: LPSNRD Monthly Average Snowfall



Source: NCDC, High Plains Regional Climate Center

HISTORICAL OCCURRENCES

Due to the regional scale of severe winter storms, the NCDC reports events as they occur in each county. While a single event can affect two or more counties at a time, the NCDC reports them as separate events.

NCDC cites 87 separate events, but many have to be the same event from different locations (given the fact that there are several on the same day) within LPSNRD from January 1996 to May 2013. No injuries or deaths were reported. However, these recorded events caused a total of $19,175,000 in property damages and $400,000 in crop damages. These events from NCDC and reported by participating communities were listed in each participant section in *Section Seven: Participant Sections*.

The following severe winter storm events were reported by participants through MindMixer:

- January 26, 1994: Freezing rain and sleet caused icing of trees and power lines. Some electrical outages also occurred. $50,000 worth of property damages was incurred.
- September 22, 1995: Record low temperatures from the lower 20s to the lower 30s put an end to an already stunted growing season across the midlands. Nearly the entire state of Nebraska fell below 28 degrees. Hardest hit were the milo, soybean, and corn crops. $262 million was reported in crop damages.
- January 19, 1996: Extreme cold temperatures were reported in the city of Lincoln resulting in $100,000 in property damages from frozen and ruptured pipes in the historic Haymarket area of Lincoln.
- March 24, 1996: Blizzard conditions in much of southeast Nebraska brought sustained winds of 30 to 50 mph with gust up to 60 mph and wind chill temperatures from 30 to 40 degrees below zero. Hundreds of motorists were stranded and several accidents occurred due to near zero visibility for more than ten hours.
- October 25, 1997: A major early season snowstorm struck much of the planning area, snow fall amounts ranged between 6 to 14 inches. More than 200,000 residents in the area were left without power, some power outages lasted for several days. In addition to the power outages, the city of Lincoln sustained damage to more than 25% of the tress in the city. This storm resulted in $56,500,000 in property damages across the state and $1,600,000 in crop and agricultural losses.
- March 7, 1998: A major winter storm moved through the central plains and created near blizzard conditions over portions of eastern Nebraska. Heavy snow combined with strong northerly winds of 40-45 mph created considerable blowing snow with 6-15 foot snow drifts throughout the planning area. Schools and businesses were closed for a few days as the strong winds continued to cause blowing snow, making clean up challenging. Throughout the affected area, there was $26,000 in reported property damages.
- September, 2007: A severe winter storm caused power interruptions and tree damages in the City of Ashland.
- December 24, 2009: Ice and later blizzard conditions produced heavy snow which made road conditions very dangerous, and in many cases, impassable in the villages of Brainard, Hallam, and Murdock. Areas in the villages of Brainard and Hallam were out of electricity due to the severe winter storm and the excessive drifts blocked all the streets, residences, and CFs in Murdock requiring extra labor and machines to remove snow and make streets drivable.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

The 'event damage estimate formula' estimates potential losses for the planning area per event based upon historical data:

$$\textbf{Average Annual Damages } (\$\mathbf{1,127,941}) = \frac{Total\ Damages\ in\ Dollars\ (\$19{,}175{,}000)}{Total\ Years\ of\ Record\ (17)}$$

$$\textbf{Annual Frequency of Hazard Event } (\mathbf{5.12}\ \boldsymbol{per\ year}) = \frac{Total\ Events\ Recorded\ (87)}{Total\ Years\ of\ Record\ (17)}$$

The average annual damages estimate was determined based upon the average damage per year since 1996 and number of historical occurrences. The primary risks for severe winter storms are exposure, driving, and post-event behaviors. The most common types of private damages occur from downed trees falling on private property and from power outages causing frozen food to thaw. This does not include loss from displacement, functional downtime, economic loss, injury, or loss of life.

VULNERABILITY ASSESSMENT

Power outages, which occur almost on an annual basis with severe winter storms in Nebraska, in combination with cold temperatures and below zero wind-chill, can pose a significant threat to human life. Highly vulnerable populations, which are defined as the people who are at the most risk in regards to this hazard, include residents of nursing homes, young children, the elderly, and those living in less than adequate environments. CFs and infrastructure including emergency response and recovery operations, warning and communication systems, wells and water treatment, and many other services vital for returning the jurisdiction's functions to normal, are at risk during severe winter storm events due to potential power outages and other damages.

Severe winter storms occur on a regional scale, and can equally affect the entire planning area. All building stock and infrastructure, including CFs, are at risk of being damaged or affected by a severe winter storm.

The collection of snow and ice on power lines and electrical equipment can cause equipment damage, downed power lines, and a loss of electricity. Snow and ice accumulations on transportation routes can lead to obstruction of traffic flow and hinder emergency response. Severe winter storms can also cause significant damage to trees, with branches downing electrical lines, blocking roadways, or causing building and property damage.

Severe winter storms regularly result in damages to power lines and telephone lines, as well as other infrastructure related to threat communication (i.e. radio and television antennas). This potential for decreased message dissemination combined with potential power outages results in higher levels of vulnerability for a number of groups within the community including: the elderly, individuals and families living below the poverty line, those isolated from social interactions, groups with limited mobility, and residents that are new to the area/region. Elderly citizens are at higher risk of being isolated during severe winter storms as a result of decreased mobility, as well as a diminished ability to remove accumulations of snow and ice from vehicles and driveways. A 2011 study conducted by the Center for Injury Research and Policy found that on average there are 11,500 injuries and 100 deaths annually related to snow removal. People, especially males over the age of 55, are 4.25 times more likely to experience cardiac symptoms during snow removal.

Individuals and families below the poverty line and those isolated from social interactions may lack resources or access to resources that could mitigate the impacts of severe winter storms, such as sufficient food supplies when snowed in or even alternative heating sources during prolonged power outages. Severe winter storms often result in closed or impassable roadways. This increases the vulnerability among segments of the population that already have decreased mobility, making it important that they have a social network that can check on them and ensure that they have access to heat and food. Finally, people who are new to the area may not know what to expect from a severe winter storm and what actions are appropriate in preparing for the event. Threat communication is imperative for informing and educating this portion of the population.

FUTURE DEVELOPMENT AND VULNERABILITY

Overall, the planning area is experiencing slight growth. However, there is a wide range of growth and decline among the individual participating jurisdictions. There are many strategies that can be undertaken to protect both existing and future assets. Communities can incorporate "living snow fences" into community designs. "Living snow fences" are strategically placed trees and shrubs that act as a wind and snow block, reducing snow drifts and decreasing amounts of snow that would otherwise blow across flat areas. Communities can also bury power lines to reduce the chance of power outages resulting from severe winter storms and ice storms. New public buildings can be designed with redundant power supplies to ensure continuity of government services.

Building codes can be enhanced to prohibit flat roofs and to increase facility strengths to withstand greater snow loads. Stakeholder groups in the area play a significant role in assisting and protecting vulnerable populations during and following severe winter storms. *Section Seven* will identify specific strategies for each participating jurisdiction. These actions were identified by local planning teams and ranked for effectiveness and potential for implementation as a part of the planning process.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that Severe Winter Storms are likely to occur annually and often cause significant property damage across the planning area.

MITIGATION ALTERNATIVES

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of severe winter storms. Some of these strategies may already be in progress within the participating jurisdictions, refer to *Section 7: Participant Section* to find details on the status of these items for a specific jurisdiction. Many of these strategies are identified and discussed in greater detail in the FEMA document, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*.

- Improve buildings codes to eliminate flat roofs in areas that expect heavy snow loads
    - Current codes do not eliminate flat roofs but they do regulate design and construction to ensure they are appropriate for local conditions
- Retrofit buildings and infrastructure to withstand snow loads
- Increase weather monitoring procedures
- Incorporate text messaging into severe weather messaging programs
    - Both County EMAs utilize text alerts
- Incorporate cable TV interruption warning systems
    - Utilized throughout the planning area
- Establish road closure policies and procedures necessary to protect the public
    - Included in the Local Emergency Operations Plans (LEOP)
- Develop continuity plans for critical community services (public and private)
    - Identified as a mitigation strategy to be implemented by multiple communities
- Establish a Tree Board to assist in the development of a tree management program
    - Required for communities participating in Tree City USA
- Participate or continue participating in Tree City USA; establish a tree maintenance ordinance
    - Refer to *Section 7* for individual communities participation
- Establish redundancies for necessary municipal services (i.e. water, gas, electric, transportation)
- Develop a database of "vulnerable populations"
- Work with community groups serving "vulnerable populations" such as Meals on Wheels programs to help monitor vulnerable groups
- Establish public education programs to increase awareness of the dangers posed by severe winter storms and ways the public can mitigation the potential impacts
    - County EMAs offer materials related to regional hazards
- Educate property owners about freezing pipes (i.e., educating homeowners and builders on how to protect their pipes)

Tornados

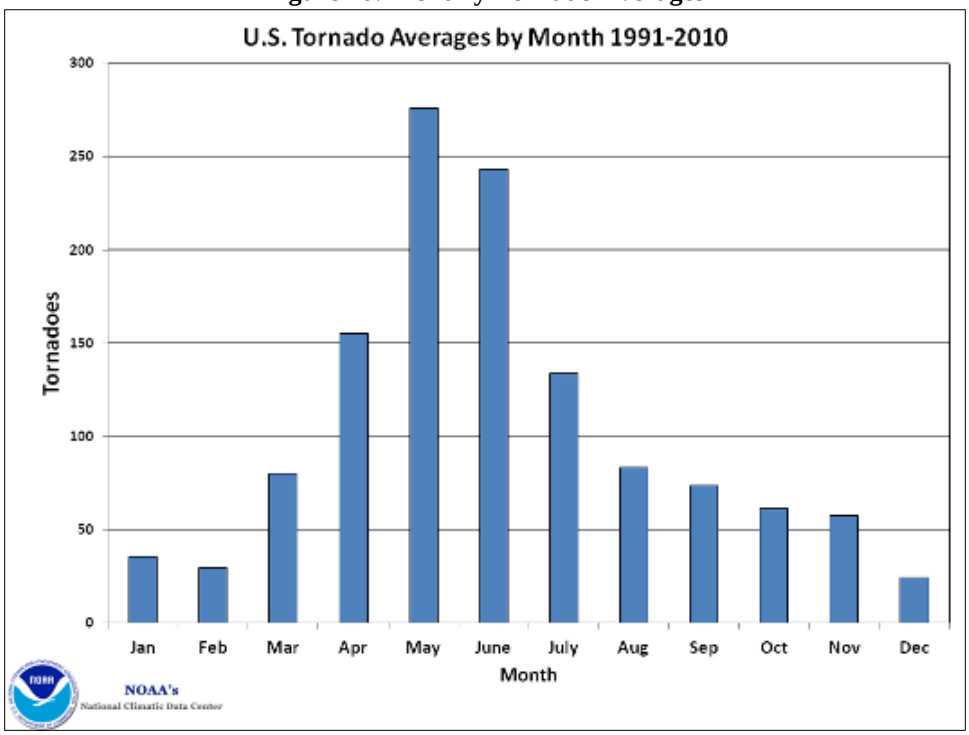
HAZARD PROFILE

A tornado is typically associated with a supercell thunderstorm. In order for rotations to be classified as tornados, three characteristics must be met:

- There must be a microscale rotating area of wind, ranging in size from a few feet to a few miles wide;
- The rotating wind, or vortex, must be attached to a convective cloud base and must be in contact with the ground; and,
- The spinning vortex of air must have caused enough damage to be classified by the Fujita Scale as a tornado.

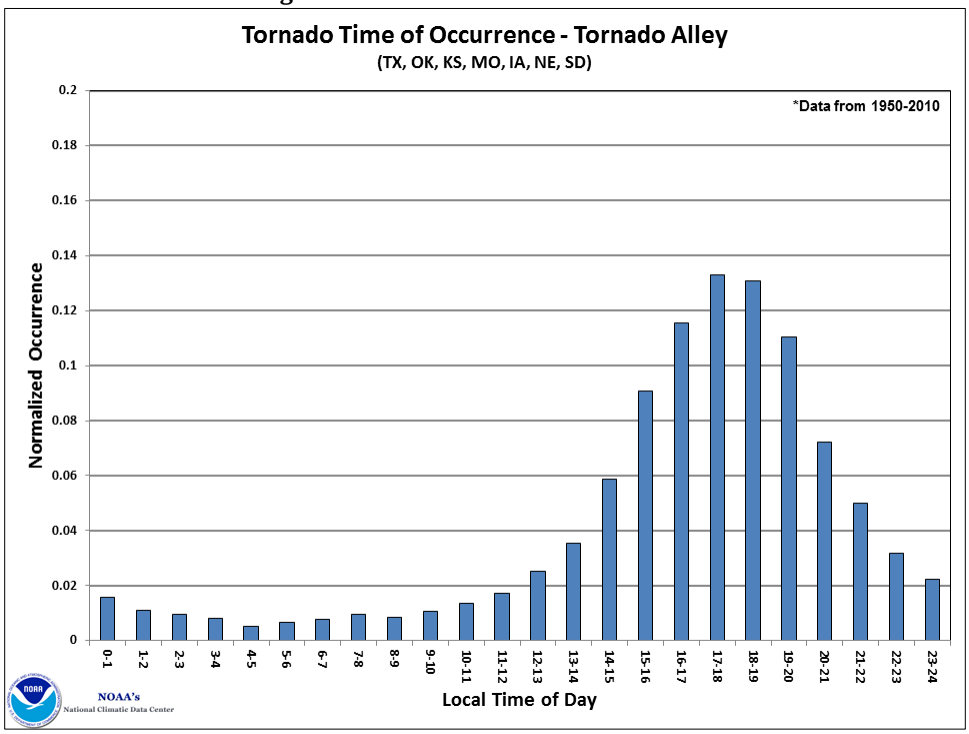
Once tornados are formed, they can be extremely violent and destructive. They have been recorded all over the world, but are most prevalent in the American Midwest and South, in an area known as "Tornado Alley." Approximately 1,000 tornados are reported annually in the contiguous United States (NOAA 2012). Tornados can travel distances over 100 miles and reach over 11 miles above ground. Tornados usually stay on the ground no more than 20 minutes. Nationally, the tornado season typically occurs between March and April. On average, 80% of tornados occur between noon and midnight. In Nebraska 77% of all tornados occur in the months of May, June, and July.

Figure 16: Monthly Tornado Averages



Source: NOAA

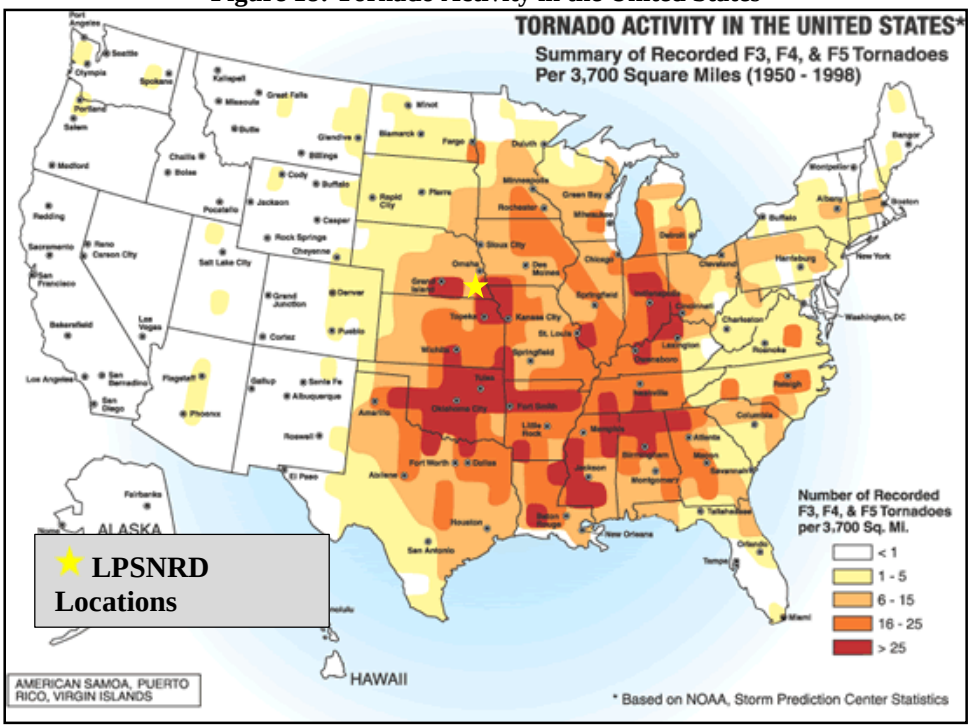
Figure 17: Tornado Time of Occurrence



Source: NOAA

Nebraska is ranked fifth in the nation for tornado frequency with an annual average of 45 tornados between 1953 and 2004 (NOAA 2011). The annual average number of tornados for Nebraska from 1991 to 2011 has increased slightly to 57 (NOAA 2013). Figure 18 shows the tornado activity in the United States as a summary of recorded F3, F4, and F5 tornados per 3,700 square miles form 1950-1998.

Figure 18: Tornado Activity in the United States



Source: United States Department of Commerce, NOAA, Storm Prediction Center Statistics

EXTENT

Tornados

After a tornado passes through an area, an official rating category is determined, which provides a common benchmark that allows comparisons to be made between different tornados. The magnitude of a tornado is measured by the Enhanced Fujita Scale. The Enhanced Fujita Scale does not measure tornados by their size or width, but rather the amount of damage caused to human-built structures and trees. The Enhanced Fujita Scale replaced the Fujita Scale in 2007. The enhanced scale classifies EF0-EF5 damage as determined by engineers and meteorologists across 28 different types of damage indicators, including different types of building and tree damage. In order to establish a rating, engineers and meteorologists examine the damage, analyze the ground-swirl patterns, review damage imagery, collect media reports, and sometimes utilize photogrammetry and videogrammetry. Based on the most severe damage to any well-built frame house, or any comparable damage as determined by an engineer, an EF-Scale number is assigned to the tornado. Tables 20 and 21 summarize the Enhanced Fujita Scale and damage indicators. According to a recent report from the National Institute of Science and Technology on the Joplin Tornado, tornados rated EF3 or lower account for around 96% of all tornado damages.

Table 20: Enhanced Fujita Scale

Storm Category	3 Second Gust (mph)	Damage Level	Damage Description
EF0	65-85 mph	Gale	Some damages to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	86-110 mph	Weak	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages might be destroyed.
EF2	111-135 mph	Strong	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	136-165 mph	Severe	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	166-200 mph	Devastating	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	200+ mph	Incredible	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
EF No rating	--	Inconceivable	Should a tornado with the maximum wind speed in excess of F5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

Source: NOAA; FEMA

Table 21: Enhanced F Scale Damage Indicators

Number	Damage Indicator
1	Small barns, farm outbuildings
2	One- or two-family residences
3	Single-wide mobile home (MHSW)
4	Double-wide mobile home
5	Apt, condo, townhouse (3 stories or less)
6	Motel
7	Masonry apt. or motel
8	Small retail bldg. (fast food)
9	Small professional (doctor office, branch bank)
10	Strip mall
11	Large shopping mall
12	Large, isolated ("big box") retail bldg.

Number	Damage Indicator
13	Automobile showroom
14	Automotive service building
15	School - 1-story elementary (interior or exterior halls)
16	School - jr. or sr. high school
17	Low-rise (1-4 story) bldg.
18	Mid-rise (5-20 story) bldg.
19	High-rise (over 20 stories)
20	Institutional bldg. (hospital, govt. or university)
21	Metal building system
22	Service station canopy
23	Warehouse (tilt-up walls or heavy timber)
24	Transmission line tower
25	Free-standing tower
26	Free standing pole (light, flag, luminary)
27	Tree - hardwood
28	Tree - softwood

Source: NOAA; FEMA

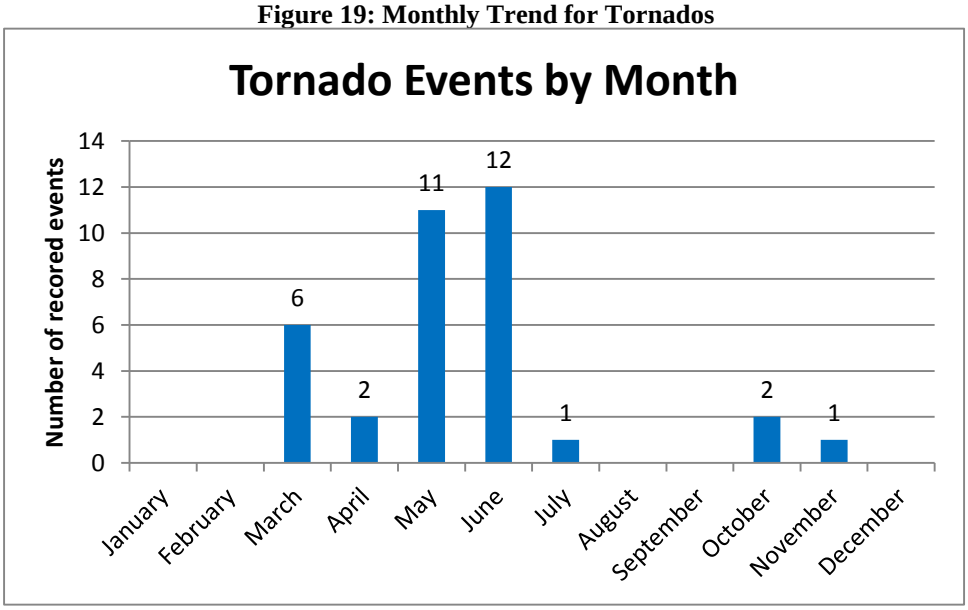
Based on the historic record it is most likely that tornados that do occur within the planning area will be of EF0 strength. Of the 35 reported events, one event was an F4 tornado in 2004, two events were EF2 tornados in 2009 and 2013, 11 events were F/EF1 tornados, all other events were F/EF 0.

Historical Occurrences

Due to the local scale of tornado events, the NCDC reports events as they occur in each city or town. While a single event can affect multiple towns or cities, the NCDC reports them as separate events.

The NCDC reported a total of 35 tornado events for the planning area from 1996 to 2013. It was reported to result in $101,309,000 in total property damages and no crop damages. There was one major event in 2004 in the area causing one death and 30 injuries. There were a total of one death and 38 injuries from 1996 to 2013.

Figure 19: Monthly Trend for Tornados



Source: NCDC

The following events listed below recorded fatalities, injuries, or significant monetary damages for the planning area.

The following tornados were reported by the NCDC for Cass or Lancaster Counties:

- August 13: 1952: An F4 tornado in Cass County resulted in twenty reported injuries, zero deaths and $250,000 in property damages.
- June 6, 1956: An F2 tornado in Lancaster County resulted in one reported injury, zero deaths and $3,000 in property damages.
- April 25, 1957: An F4 tornado in Lancaster County resulted in eight reported injuries, one death and $2.5 million in property damages.
- August 30, 1959: An F2 tornado in Lancaster County resulted in zero reported injuries or deaths and $25,000 in property damages.
- May 10, 1967: An unrated tornado in Lancaster County resulted in zero reported injuries or deaths and $250,000 in property damages
- April 3, 1981: An F2 tornado in Lancaster County resulted in zero reported injuries or deaths and $250,000 in property damages.
- May 1, 1983: An F1 tornado in Cass County resulted in three reported injuries, zero deaths and $250,000 in property damages
- June 12, 1984: An F2 tornado in Lancaster County resulted in zero reported injuries or deaths and $2.5 million in property damages
- May 22, 2004: An F4 tornado in Lancaster County resulted in 38 reported injuries, one reported death and more than $100 million in property damage. This tornado was the previous national record holder for peak width at nearly 2.5 miles wide.
- March 23, 2009: Multiple F1 tornados in Cass County resulted in 8 reported injuries and no deaths with $1,000,000 in monetary damages reported.
- June 1, 2010: An F1 tornado in Cass County resulted in zero injuries or deaths with $4,000 reported in property damages.

The following tornados were reported by participants at the public meetings:

- June 1, 1912: A tornado hit village of Hallam and caused substantial damages to nearby homes, barns, and machinery as well as one death.
- May 22, 2004: An F4 tornado hit the village of Hallam and resulted in one death and many injuries. It was reported that most of the town was destroyed and needed to be rebuilt. This severe event also caused the town to be out of adequate of utilities, water and sewer system, and gas and electricity system for an extended period of time.
- June 4, 2008: An F1 tornado totally destroyed two residential properties and caused substantial damage to at least three more in the village of Ceresco. Almost all structures in the village sustained damages as well as a lot of trees were lost. This tornado also resulted in electricity breakdown that lasted five days.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

The average annual damage estimate was determined based upon the average damage per year between 1996 and 2013 and number of historical occurrences. This does not include loss from displacement, functional downtime, economic loss, injury, or loss of life. It should be noted that the total crop damages were included in the event details to express the magnitude of the event, but were not calculated into the average damage per event estimate.

TORNADO:

$$\textbf{Average Annual Damages } (\$\mathbf{5,961,000}) = \frac{Total\ Damages\ in\ Dollars\ (\$101{,}337{,}000)}{Total\ Years\ of\ Record\ (17)}$$

$$\textbf{Average Annual Frequency } (\mathbf{2.06}\ \boldsymbol{per\ year}) = \frac{Total\ Events\ Recorded\ (35)}{Total\ Years\ of\ Record\ (17)}$$

The average damage per event estimate was determined based upon the total damages in dollars since 1996 and the number of historical occurrences. This does not include loss of displacement, functional downtime, economic loss, injury, or loss of life. It should be noted that the total crop damages were included in the event details to express the magnitude of the event, but were not calculated into the average damage per event estimate, as crop damages would likely not affect the area.

VULNERABILITY ASSESSMENT

Tornados occur throughout the planning area. All building stock and above ground infrastructure, including CFs, are at risk of being damaged or affected by tornados and high winds. Tornados and high winds can cause structure losses, downed power lines, loss of electricity, obstruction to traffic flow, and significant damage to trees and center-pivot irrigation systems. A catastrophic event could lead to major economic loss for the jurisdiction. High wind speeds and flying debris can pose a significant threat to human life.

Tornados can impact a wide range of people and properties. People living in mobile homes are even more susceptible to the effects of tornados (6.3% of housing units in Cass County and 2% of housing units in Lancaster County). Mobile homes which are not anchored or are not anchored properly can be blown over by winds as small as 60 – 70 mph. A 2007 study conducted by Dr. W. Ashley at Northern Illinois University found that between 1985 and 2005, 44% of all tornado related fatalities occurred in mobile homes, while between 20 and 30% occurred in permanent homes. Tornado related deaths in mobile homes have increased over the timeframe investigated from 37% of all fatalities from 1986 to 1990 to nearly 57% of all fatalities from 2001 to 2005. The timing of tornados also impacts the vulnerability of people living in mobile homes. The 2007 study found that while only 25.8% of tornados occur between sunset and sunrise they account for 42.5% of tornado fatalities. This is a result of a number of factors including: decreased ability to identify tornados in the dark,

decreased ability to communicate tornado threats due to a high rate of people sleeping during the night, and a higher number of people in the housing units (i.e. mobile home) during the nighttime.

Other factors that may increase vulnerability to the threat posed by tornados include age, poverty levels, and home rentals. The 2007 study found that the middle aged (those over 40 years of age) and the elderly are more vulnerable to tornados. This may be a result of decreased mobility, higher rate of auditory complications, or lack of resources needed to mitigate potential tornado related impacts.

FUTURE DEVELOPMENT AND VULNERABILITY

There are some changes that communities can make to partially mitigate the impacts resulting from tornados and strong winds. Building codes for new structures can be strengthened, requiring increased rebar in foundations, enhanced nailing patterns for wall sheathing, and the use of Simpson Strong Ties and Straps. Building codes can also be strengthened to require the use of anchors and tie-downs of mobile homes. Additionally, individuals can choose to build to an optional Code Plus Standard, such as Fortified for Safer Living. Saferooms can be installed in new structures as well as made to adapt to existing structures. In-ground saferooms can be installed in existing structures for as little as $4,000. The installation of public saferooms in areas around vulnerable populations, such as mobile home parks, can increase safety of residents in those areas.

Considerations for future development should include developing tornado saferooms in/near mobile home parks. The 2003 Tornado Shelters Act authorizes communities to use Community Development Block Grant (CDBG) funds for construction of tornado-safe shelters in manufactured home parks with 20 or more housing units consisting predominately of low- and moderate-income residents.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that tornados do not occur as frequently as some of the other hazards, but can have significant impacts when they do occur. Historically, there have been high property damages and injuries.

MITIGATION ALTERNATIVES

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of tornados and high winds. Some of these strategies may already be in progress within the participating jurisdictions, please see *Section 7: Participant Section* to find details on the status of these items for a specific jurisdiction. Many of these strategies are identified and discussed in greater detail in the FEMA document, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*

- Enhance building codes to incorporate wind –resistant building techniques
    - Most communities with building codes have wind load requirements
- Bury overhead power lines
    - Many communities have a portion of powerlines buried but there is still a great need across the planning area
- Establish redundancies for necessary municipal services (i.e. water, gas, electric, transportation)
    - This varies from jurisdiction to jurisdiction
- Establish data recovery program and backup program for municipal employees
- Establish a Tree Board to assist in the development of a tree management program
- Participate in Tree City USA; establish a tree maintenance ordinance
    - Refer to Section 7 for individual communities participation
- Encourage the construction of safe rooms
    - This is a need for many communities in the planning area
- Require tornado saferooms in newly constructed municipal buildings
    - Not in place within the planning area
- Work with trailer and mobile home parks to develop tornado safe rooms

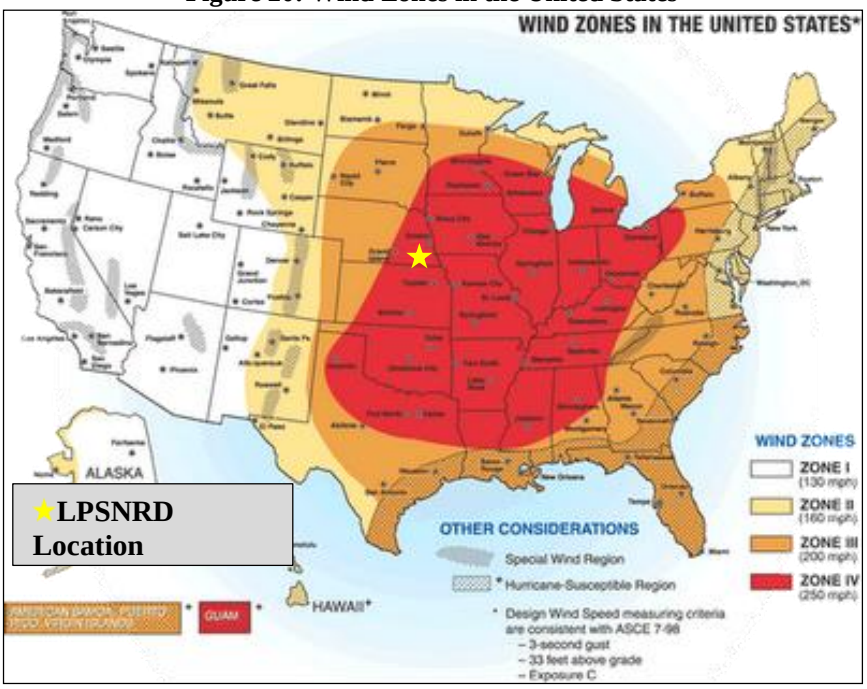
    - The City of Lincoln is working towards saferooms near vulnerable populations
- Ensure schools are equipped with sufficient safe space for their maximum student capacity
- Develop maps of "vulnerable populations" and saferooms located near those groups
    - Most communities in the planning area have not attempted this
- Ensure outdoor warning sirens are functional and located adequately to warn the public of potential tornado events
    - County EMAs perform regular test to ensure function of sirens
- Incorporate text messaging into severe weather messaging programs
    - Text alerts occur within the planning area
- Incorporate cable TV interruption warning systems
    - Text alerts occur within the planning area
- Establish mutual aide agreements with neighboring communities and privately owned businesses
- Develop business continuity plans for critical community services (public and private)
    - Identified as a mitigation strategy to be implemented by multiple communities
- Establish public education programs to increase awareness of the dangers posed by severe tornados and strong winds and ways the public can mitigate the potential impacts
    - County EMAs offer materials related to regional hazards

High Winds

HAZARD PROFILE

High winds typically accompany severe thunderstorms and severe winter storms and can cause significant property and crop damage, downed power lines, loss of electricity, obstruction to traffic flow, and significant damage to trees and center-pivot irrigation systems. All building stock and above ground infrastructure, including CFs, are at risk of being damaged or affected by high winds. High wind speeds and flying debris can pose a significant threat to human life. Figure 22 shows the wind zones in the United States.

Figure 20: Wind Zones in the United States



Source: FEMA

EXTENT

The NWS defines High Winds as sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. The NWS issues High Wind Advisories when there are sustained winds of 25 to 39 miles per hour and/or gusts to 57 mph. The Beaufort Wind Scale can be used to classify wind strength. Table 22 outlines the scale, providing wind speed ranking, range of wind speeds per ranking, and a brief description of conditions for each ranking.

Table 22: Beaufort Wind Force Rankings

Beaufort Wind Force Ranking	Range of Wind Speeds	Conditions
0	<1 mph	Smoke rises vertically
1	1 – 3 mph	Direction shown by smoke but not wind vanes
2	4 – 7 mph	Wind felt on face; leaves rustle; wind vanes move
3	8 – 12 mph	Leaves and small twigs in constant motion
4	13 – 18 mph	Raises dust and loose paper; small branches move
5	19 – 24 mph	Small trees in leaf begin to move
6	25 – 31 mph	Large branches in motion; umbrellas used with difficulty
7	32 – 38 mph	Whole trees in motion; inconvenience felt when walking against the wind
8	39 – 46 mph	Breaks twigs off tree; generally impedes progress
9	47 – 54 mph	Slight structural damage; chimneypots and slates removed
10	55 – 63 mph	Trees uprooted; considerable structural damages; improperly or mobiles homes with no anchors turned over
11	64 – 72 mph	Widespread damages; very rarely experienced
12 – 17	72 - >200 mph	Hurricane; devastation

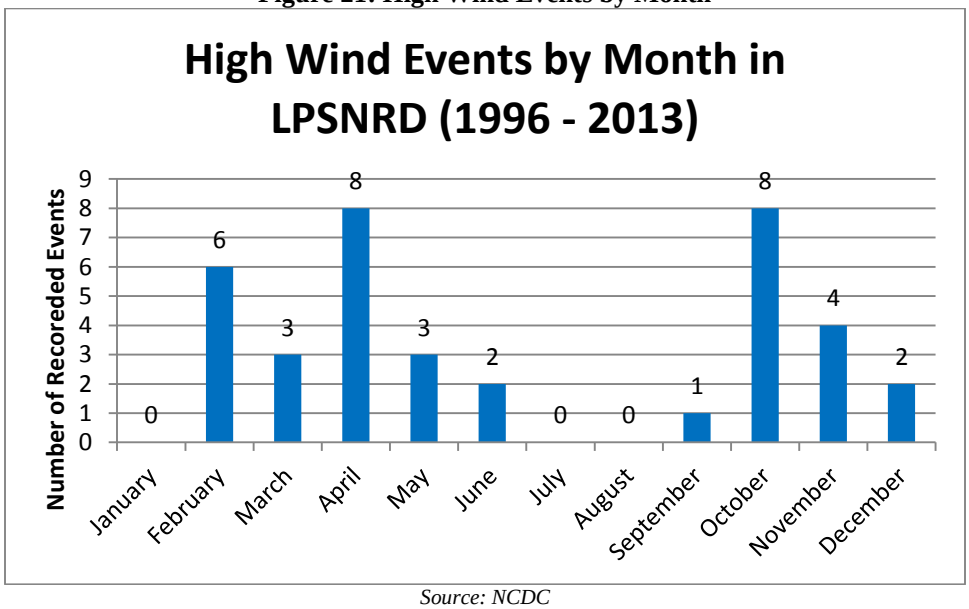
Source: NWS

Using the NCDC reported events the most common high wind event is a level 8/9. The reported high wind events produced an average event with 47 mph wind and gusts over 60 mph.

HISTORICAL OCCURRENCES

Due to the regional scale of high winds, the NCDC reports events as they occur in each county. While a single event can affect two or more counties at a time, the NCDC reports them as separate events. NCDC cites 37 separate events, but many have to be the same event from different locations (given the fact that there are several on the same day) within LPSNRD from January 1996 to May 2013. These recorded events also caused $32,000 property damages and one injury. The jurisdiction specific events from NCDC and reported by each community were listed in each participant section in *Section Seven: Participant Sections*.

Figure 21: High Wind Events by Month



Source: NCDC

The following high wind event was reported by participants at the public meetings:

- May 22, 2004: A high wind event took place in the village of Avoca that caused tree damage in all areas, broke limbs, and ruined electric lines.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

The average annual damage was determined based upon the total damages between 1996 and 2013 and number of historical occurrences. This does not include loss from displacement, functional downtime, economic loss, injury, or loss of life. It should be noted that the total crop damages were included in the event details to express the magnitude of the event, but were not calculated into the average annual damage estimate.

HIGH WINDS:

$$\textbf{Average Annual Damage } (\$\mathbf{1882}) = \frac{Total\ Damages\ in\ Dollars\ (\$32{,}000)}{Total\ Years\ of\ Record\ (17)}$$

$$\textbf{Annual Frequency of Hazard Event } (\mathbf{2.17}\ \boldsymbol{per\ year}) = \frac{Total\ Events\ Recorded\ (37)}{Total\ Years\ of\ Record\ (17)}$$

The average damage per event estimate was determined based upon the average damage per event since 1996 and the number of historical occurrences. This does not include loss of displacement, functional downtime, economic loss, injury, or loss of life. It should be noted that the total crop damages were included in the event

details to express the magnitude of the event, but were not calculated into the average damage per event estimate, as crop damages would likely not affect the area.

VULNERABILITY ASSESSMENT

High winds occur with regularity throughout the planning area. All building stock and above ground infrastructure, including CFs, are at risk of being damaged or affected by high winds. High winds can cause structure loss, downed power lines, loss of electricity, obstruction to traffic flow, and significant damage to trees and center-pivot irrigation systems. A catastrophic event could lead to major economic loss for the jurisdiction. High wind speeds and flying debris can pose a significant threat to human life.

Other factors that may increase vulnerability to the threat posed by tornados include age, poverty levels, and home rentals. The 2007 study found that the middle aged (those over 40 years of age) and the elderly are more vulnerable to tornados. This may be a result of decreased mobility, higher rate of auditory complications, or lack of resources needed to mitigate potential tornado related impacts.

FUTURE DEVELOPMENT AND VULNERABILITY

There are some changes that communities can make to partially mitigate the impacts resulting from strong winds. Building codes for new structures can be strengthened, requiring increased rebar in foundations, enhanced nailing patterns for wall sheathing, and the use of Simpson Strong Ties and Straps. Building codes can also be strengthened to require the use of anchors and tie-downs of mobile homes. Additionally, individuals can choose to build to an optional Code Plus Standard, such as Fortified for Safer Living. Saferooms can be installed in new structures as well as made to adapt to existing structures. In-ground saferooms can be installed in existing structures for as little as $4,000. The installation of public saferooms in areas around vulnerable populations, such as mobile home parks, can increase safety of residents in those areas.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that high winds do not occur as frequently as some of the other hazards, but can have significant impacts when they do occur. Historically, there have been some property damages but no injuries.

MITIGATION ALTERNATIVES

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of tornado and strong winds. Some of these strategies, such as the use of warning systems, are already in place in the planning area. Many of these strategies are identified and discussed in greater detail in the FEMA document *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*.

- Enhance building codes to incorporate wind –resistant building techniques
- Bury overhead power lines
- Establish redundancies for necessary municipal services (i.e. water, gas, electric, transportation)
- Establish data recovery program and backup program for municipal employees
- Establish a Tree Board to assist in the development of a tree management program
- Participate, or continue participating, in Tree City USA; establish a tree maintenance ordinance
- Encourage the construction of safe rooms
- Require tornado saferooms in newly constructed municipal buildings
- Work with trailer and mobile home parks to develop tornado safe rooms
- Ensure schools are equipped with sufficient safe space for their maximum student capacity
- Develop maps of "vulnerable populations" and saferooms located near those groups
- Ensure outdoor warning sirens are functional and located adequately to warn the public of potential tornadic events
- Incorporate text messaging into severe weather messaging programs
- Incorporate cable TV interruption warning systems

- Establish mutual aide agreements with neighboring communities and privately owned businesses
- Develop business continuity plans for critical community services (public and private)
- Establish public education programs to increase awareness of the dangers posed by severe tornados and strong winds and ways the public can mitigation the potential impacts

Severe Thunderstorms (Thunderstorm and Lightning)

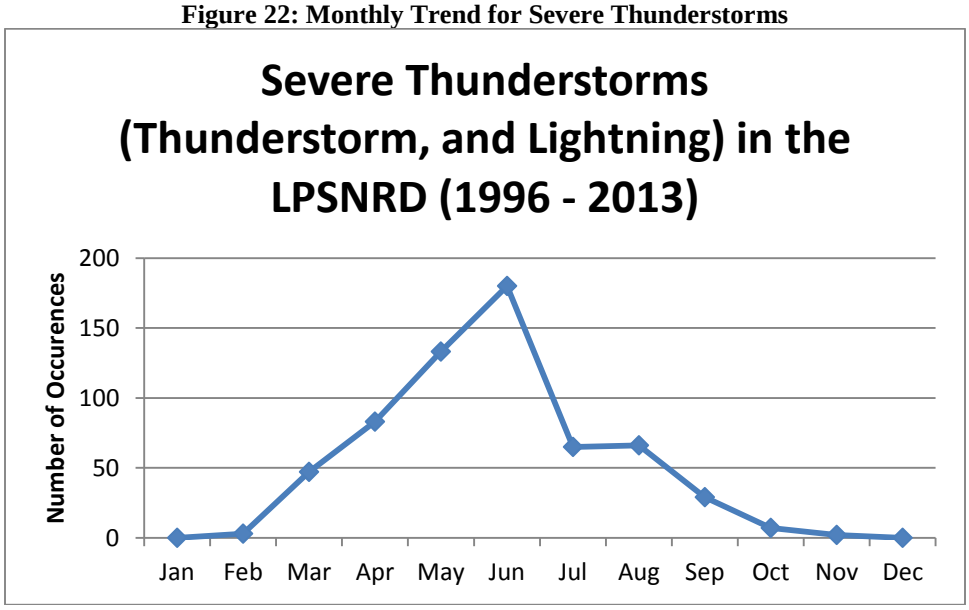
HAZARD PROFILE

Severe thunderstorms are common and unpredictable annual events throughout the central and southern United States. Thunderstorms differ from many other hazards in that they are generally large in magnitude, have a long duration, and travel across large areas and through multiple jurisdictions within a single region. Additionally, thunderstorms often occur in series, with one jurisdiction having the potential to be hit multiple times in one day.

A severe thunderstorm is defined by winds measuring 58 miles per hour or greater, hail one inch or larger, or the presence of tornado activity.

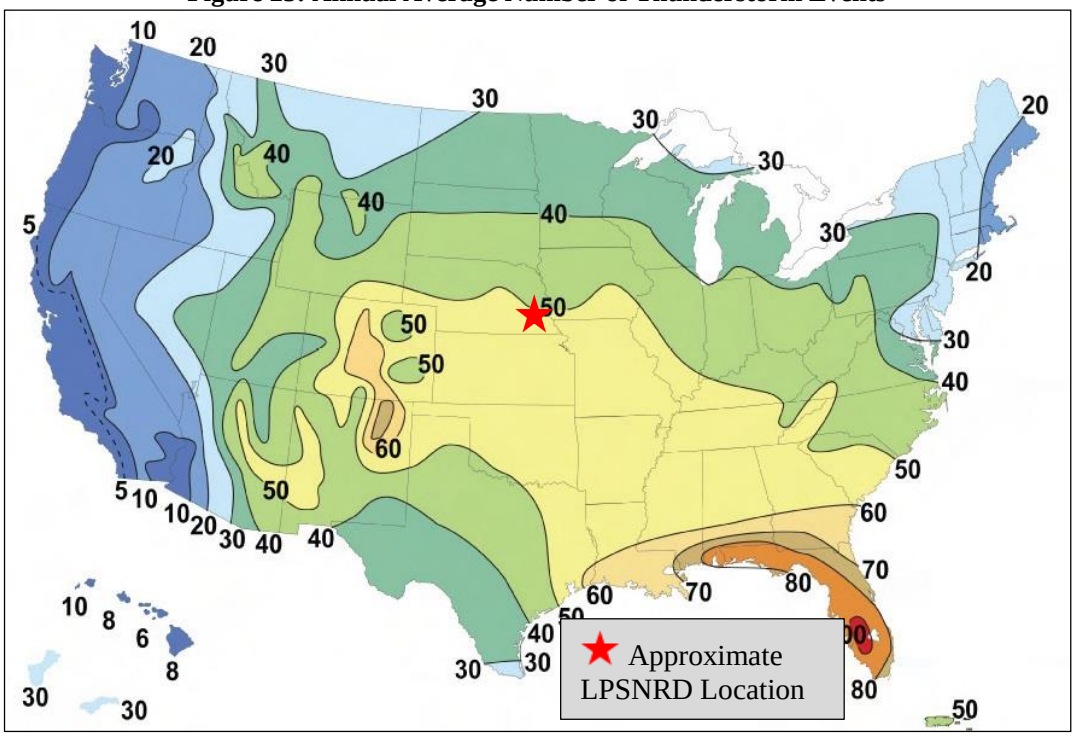
Severe thunderstorms in LPSNRD usually occur in the evening during the spring and summer months, see Figure 22 These often massive storms can include heavy rain, hail, lightning, high wind, and can produce tornados with little or no advanced warning. Furthermore, heavy rains can cause flooding, lightning can cause wildfires, and high winds can down trees, cause power outages, and destroy property with their shear force.

Figure 22: Monthly Trend for Severe Thunderstorms



Economically, thunderstorms are generally beneficial in that they provide moisture necessary to support Nebraska's largest industry, agriculture. The majority of thunderstorms do not cause damage, but when they escalate to the point of becoming severe, the potential for damages include crop losses from wind and hail, property losses due to buildings and automobiles damaged by hail, wind, or flash flooding, and death or injury to humans and animals from lightning, drowning, or being struck by falling or flying debris. Figure 23 displays the average number of days of thunder events across the country each year, with Nebraska experiencing between 40 to 50 days from north to south across the state.

Figure 23: Annual Average Number of Thunderstorm Events



Source: http://www.nws.noaa.gov/om/severeweather/index.shtml

Thunderstorms can develop in less than 30 minutes, and can grow to an elevation of eight miles into the atmosphere. There are an estimated 100,000 thunderstorms in the United States each year, of which 10% are severe. Lightning, by definition, is present in all thunderstorms and can be harmful to humans and animals, cause fires to buildings and agricultural lands, and cause electrical outages in municipal electrical systems. Between 1977 and 2006, averages of 62 people were killed each year by lightning in the United States. In Nebraska, eight fatalities were attributed to lightning between 1990 and 2003. Lightning can strike up to 10 miles from the portion of the storm depositing precipitation. There are three primary types of lightning: intra-cloud, inter-cloud, and cloud to ground. While intra and inter-cloud lightning are more common, it is when lightning comes in contact with the ground that society is potentially impacted. Lightning generally occurs when warm air is mixed with colder air masses resulting in atmospheric disturbances necessary for polarizing the atmosphere. There is no scale for measuring lightning. Damaging hailstorms are also common in severe thunderstorms. Hail measuring just three-quarters of an inch can approach speeds of 100 mph. Hail causes nearly $1 billion in damage to property and crops annually.

EXTENT

A major component of severe thunderstorms is rainfall accumulations. For the planning area it is reasonable to expect spring (March, April and May) and summer (June, July and August) to have the highest rainfall totals. Using data provided by the High Plains Regional Climate Center the spring months should have an average of 24 days with at least trace amounts of precipitation. 16 of those 24 days will receive precipitation totals greater than one tenth of an inch; approximately 5 of the 24 days will have more than one half an inch of precipitation; and approximately 2 of the 24 days will report rainfall totals equal to or greater than one inch. During the summer months the planning area can expect to receive at least trace amounts of precipitation on 25 days. More than 17 of those 25 days will report totals greater than or equal to one tenth of an inch; 7 of the 25 days will report rainfall totals of at least one half an inch; and 3 of the 25 days will report precipitation totals of at least one inch.

HISTORICAL OCCURRENCES

The NCDC reports events as they occur in *each* community. A single severe thunderstorm event can affect multiple communities at a time; the NCDC reports these large scale, multi-community events as separate events. The result is a single thunderstorm event covering the entire region could be reported by the NCDC as several events. NCDC cites 180 separate events, but many have to be the same event from different locations (given the fact that there are several on the same day) within LPSNRD from January 1996 to August 2013. No injuries or deaths were reported. These recorded events caused a total of $3,285,400 in property damages, 3 injuries, no deaths, and no crop damages. The jurisdiction specific events from NCDC and reported by each community were listed in each participant section in *Section Seven: Participant Sections*.

The following severe thunderstorm events were reported by the NCDC as causing injuries or death in Cass County:

- July 18, 1985: Severe thunderstorm winds injured five people. No property damage was reported.
- June 2, 1989: A severe thunderstorm with winds exceeding 59 mph injured one person. No property damage was reported.
- July 4, 1994: Strong winds blew down a 100-foot tall cottonwood tree. The upper limbs, which were between two and three feet in diameter, hit a tent that two people were camping in. A 58 year old male was killed and a 31 year old female was injured.

The following severe thunderstorm events were reported by the NCDC as causing injuries, death, or property damage in Lancaster County:

- May 7, 1993: In the city of Lincoln lighting striking a radio station resulted in $50,000 in property damages to the computer, telephone, and satellite equipment.
- May 22, 1996: In the city of Lincoln a severe thunderstorm with winds up to 83 mph damaged the roof of the Duncan Aviation facility and overturned multiple aircraft. The storm also damaged the roof at the State Fair Park's grandstand. The city of Lincoln sustained damages in the form of downed power lines and trees. The reported property damage for this event was $1.4 million.
- July 10, 1997: In the city of Lincoln lightning striking the roof of a home resulted in $25,000 in property damages.
- July 11, 2000: In the village of Bennet a severe thunderstorm with wind gust estimated at 70 mph resulted in $20,000 in property damages.
- July 20, 2000: In the town of Firth a severe thunderstorm with 50 mph winds and 2¾ inch hailstones resulted in damages to 148 of the 200 homes and business in the town. The total damages were $1 million in property damages and $2 million in crop damages.
- April 14, 2001: In the village of Bennet a severe thunderstorm with wind up to 70 mph damaged a garage, farm building, and power lines. The reported property damage for this event was $25,000.
- April 20, 2001: In the village of Raymond a severe thunderstorm with winds estimated at 80 mph knocked over a utility pole and damaged a house outside the village limits. The reported property damage for this event was $20,000.
- August 19, 2003: In the city of Lincoln lightning striking three businesses was responsible for $90,000 in property damages.
- August 8, 2006: In the city of Lincoln lightning striking a laundry facility was responsible for $225,000 in property damages.

The following thunderstorm events were reported by participants at the public meetings:

- Jun 21, 1996: In the city of Ashland lightning striking a barn was responsible for $3,000 worth of damage.
- June 20, 1997: In the city of Ashland a severe thunderstorm with high wind occurred that knocked down trees and was reported to cause $50,000 total property damage.
- July 5, 2003: In the city of Ashland a severe thunderstorm with high wind occurred that caused one injury.

- June, 2010: In the city of Weeping Water lightning damaged the water well control.
- September 13, 2010: In the village of Murdock a severe thunderstorm occurred with high winds that broke tree limbs, took power lines down, and caused damage to a few homes and roof of the village hall. As a result, extra labor and machines were needed to haul and grind tress.
- May, 2012: In the village of Union a severe thunderstorm with golf-ball size hail occurred that caused damage to a substantial number of residential roofs and commercial properties.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

Severe thunderstorms occur on an irregular basis with varying magnitudes and can cause a wide range of damage. The damage can range from a few downed tree limbs to wide spread tree loss, hail damage, and significant property damage. The 'damage estimate formula' estimates potential losses for the planning area per year based upon historical data:

SEVERE THUNDERSTORM

$$\textbf{Average Annual Damages } (\$\mathbf{193,258}) = \frac{Total\ Damages\ in\ Dollars\ (\$3{,}285{,}400)}{Total\ Years\ Recorded\ (17)}$$

$$\textbf{Annual Frequency of Hazard Event } (\mathbf{11}\ \boldsymbol{per\ year}) = \frac{Total\ Events\ Recorded\ (179)}{Total\ Years\ of\ Record\ (17)}$$

This does not include loss of displacement, functional downtime, economic loss, injury, or loss of life. It should be noted that the total crop damages were included in the event details to express the magnitude of the event, but were not calculated into the average damage per event estimate, as crop damages would likely not affect the area.

VULNERABILITY ASSESSMENT

Severe thunderstorms and hail occur on an annual basis, and can equally affect the entire planning area. Severe thunderstorms can produce heavy rain, flooding, damaging hail, lightning, and high winds during and after the event. All building stock and infrastructure including CFs, vehicles, power lines, trees, and utilities are at risk of being damaged or affected by severe thunderstorms. According to climate data, May and June have the greatest amounts of rainfall. This coincides with severe thunderstorms and increased tornado activity during these months.

Severe thunderstorms can cause property damage or loss, downed power lines, loss of electricity, obstruction to traffic flow, significant damage to trees, and pose a threat to human life. The electrical infrastructure is highly vulnerable to damages from lightning strikes and downed tree branches, roadways are vulnerable to wash outs and surface damages from flash floods, and building stock and personal property are vulnerable to damages from large hail stones. Severe thunderstorms can also cause significant damage to crops, levees, and dams throughout the rural areas of the planning area.

Vulnerable populations related to severe thunderstorms include the elderly, those living in mobile homes, and those caught outside during storm events. During severe thunderstorms, it is not uncommon for residents/towns to lose power for a temporary or prolonged period of time. These power outages may prove deadly for elderly citizens that are reliant upon machines to remain alive. The elderly are generally less mobile than many other members or the community, making them more vulnerable to a wide range of threats. Mobile homes that are not anchored or are improperly anchored are also at high risk during thunderstorms because they can be turned over by a wind of 60 to 70 mph. Severe thunderstorms are defined by winds in excess of 58 mph.

Lightning is commonly considered the most dangerous and most frequently encountered weather hazard. The most vulnerable groups related to lightning strikes are people located outside during storm events. Vulnerable areas to consider include public parks, campgrounds, swimming pools, and schools with playgrounds.

Future Development and Vulnerability

Building codes can be enhanced so that they require or recommend the use of hail resistant material, tie-downs and ground anchors for mobile homes, and architectural designs that reduce or limit potential for wind-born debris. Existing structures can also incorporate hail resistant products such as concrete roof tiles and siding. CFs should install and utilize surge protectors to ensure continuity of vital services. Power lines can be buried to decrease the chance of prolonged power outage and saferooms can be constructed near vulnerable populations (schools, daycares, mobile home parks, etc.) to increase safety for residents in those areas. Communities can also establish Tree Boards and tree ordinances to ensure urban canopies are safe and healthy, reducing the potential impacts of severe thunderstorms.

Risk Assessment Summary

Overall, the risk and vulnerability assessment shows that thunderstorms are likely to occur several times every year, but do not cause as much property damage as severe winter weather. While NCDC does collect damages from thunderstorms it is likely that some damages may be missed or minor damages go unreported. This hazard can adversely impact various segments of the population.

Mitigation Alternatives

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of severe thunderstorms. Many of these strategies are identified and discussed in greater detail in the FEMA document, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*

- Install and maintain surge protection for CFs
- Incentive programs to encourage the use of hail resistant roofing materials for new and existing structures
    - Identified as a mitigation strategy to be implemented by multiple communities
- Bury overhead power lines
    - Many communities have a portion of powerlines buried but there is still a great need across the planning area
- Establish a Tree Board to assist in the development of a tree management program
- Participate in Tree City USA; establish a tree maintenance ordinance
    - Refer to Section 7 for individual communities participation
- Establish redundancies for necessary municipal services (i.e. water, gas, electric, transportation)
    - This varies from jurisdiction to jurisdiction
- Establish data recovery program and backup program for municipal employees
- Establish community severe weather warning protocols
    - Included in the Local Emergency Operations Plans (LEOP)
- Incorporate text messaging into severe weather messaging programs
    - Both County EMAs utilize text alerts
- Incorporate cable TV interruption warning systems
    - Utilized within the communities
- Purchase and issue weather radios to CFs and vulnerable populations
    - This is an ongoing project for many communities
- Establish mutual aide agreements with neighboring communities and privately owned businesses
    - In place for a majority of participants
- Develop business continuity plans for critical community services (public and private)
- Establish public education programs to increase awareness of the dangers posed by severe thunderstorms and ways the public can mitigation the potential impacts
    - County EMAs offer materials related to regional hazards

Hail (Hailstorm)

HAZARD PROFILE

Hail is usually associated with severe thunderstorms. This association makes hail just as unpredictable as a severe thunderstorm. Hail events in thunderstorms differ from many other hazards in that they are generally large in magnitude, have a long duration, and travel large areas and through multiple jurisdictions within a single region. Additionally, hail events in thunderstorms often occur in series, with one area having the potential to be hit multiple times in one day.

Severe thunderstorms in the planning area usually occur in the evening during the spring and summer months. These often massive storms can include heavy rain, hail, lightning, high wind, and can produce tornados with little or no advanced warning. Furthermore, hail can destroy property and crops with their shear force as some hail stones can fall at 100 mph.

While the moisture from the thunderstorms that are associated with hail events can be beneficial. When thunderstorms do produce hail the potential for crop losses, property losses due to building and automobile damages, and personal injury from people not seeking shelter during these events. The potential for damages increases as the size of the hail increases.

EXTENT

The TORRO scale is used throughout the United Kingdom to classify hailstones and provides some detail related to the potential impacts from hail. Table 23 outlines the TORRO Hailstone Scale.

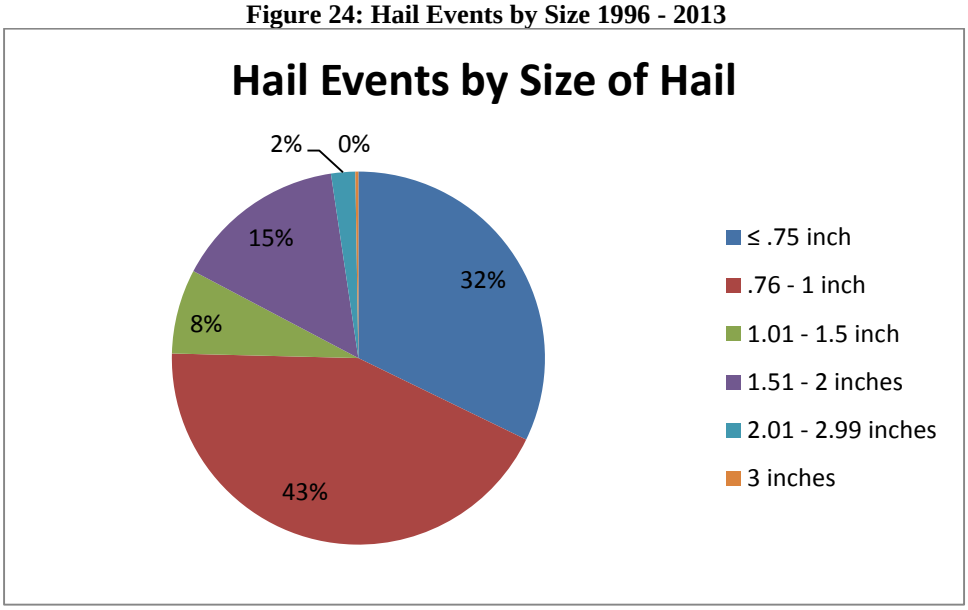
Table 23: TORRO Hailstone Scale

TORRO Classification/Intensity	Typical Hail Diameter	Typical Damage Impacts
H0: Hard Hail	5 mm; Pea size	No damage
H1: Potentially Damaging	5 -15 mm (marble)	Slight general damage to plants and crops
H2: Significant	10 -20 mm (grape)	Significant damage to fruit, crops, and vegetation
H3: Severe	20 -30 mm (Walnut)	Severe damage to fruit and crops, damage to glass and plastic structures
H4: Severe	30 -40 mm (Squash Ball)	Widespread damage to glass, vehicle bodywork damaged
H5: Destructive	40 – 50 mm (Golf ball)	Wholesale destruction of glass, damage to tiled roofs; significant risk or injury
H6: Destructive	50 – 60 mm (chicken egg)	Grounded aircrafts damaged, brick walls pitted; significant risk of injury
H7: Destructive	60 – 75 mm (Tennis ball)	Severe roof damage; risk of serious injuries
H8: Destructive	75 – 90 mm (Large orange)	Severe damage to structures, vehicles, airplanes; risk of serious injuries
H9: Super Hail	90 – 100 mm (Grapefruit)	Extensive structural damage; risk of severe or even fatal injuries to persons outdoors
H10: Super Hail	>100 mm (Melon)	Extensive structural damage; risk or severe or even fatal injuries to persons outdoors

25.4 mm = 1 inch

Hail is another component of severe thunderstorms in Nebraska and the planning area. Of the 340 hail events reported for the planning area the average hailstone size is 1.10 inches. Events of this magnitude correlate to an H3 classification. It is reasonable to expect H3 classified events to occur more than one time per year in the planning area. It is realistic to expect an H7 event to occur approximately one time per year in the planning area. Figure 24 shows the hail events based on the size of the hail.

Figure 24: Hail Events by Size 1996 - 2013



Historical Occurrences

The NCDC reports events as they occur in *each* community. A single hail event can affect multiple communities at a time; the NCDC reports these large scale, multi-community events as separate events. The result is a single hail event covering the entire region could be reported by the NCDC as several events. NCDC cites 340 separate events, but many have to be the same event from different locations (given the fact that there are several on the same day) within LPSNRD from January 1996 to May 2013. No injuries, deaths or damages were reported. This source did not record specific damages for countywide events. The jurisdiction specific events from NCDC and reported by each community were listed in each participant section in *Section Seven: Participant Sections*.

The following hail events were reported as causing injuries, death, or property damage in Cass County:

- July 28, 1996: Thunderstorms producing hail resulted in over 1,000 claims of damages to vehicles and homes in the Plattsmouth area. This event was responsible for $1,000,000 in property damages and $250,000 in crop damages.

The following hail events were reported as causing injuries, death, or property damage in Lancaster County:

- September 2, 1995: In the city of Lincoln hail stones up to 4.5 inches in diameter caused $20,000 in property damage. This same storm resulted in $20,000 in crop damages around the town of Malcolm.
- July 20, 2000: In the village of Firth and the surrounding area a storm producing hail as large as baseballs damaged 148 of 200 houses and business within the town, nearly every north facing window was broken out. This storm was responsible for $2,000,000 in property damages and $1,000,000 in crop damages.

Average Annual Damages and Frequency

Severe thunderstorms occur on an irregular basis with varying magnitudes and can cause a wide range of damage. The damage can range from a few downed tree limbs to wide spread tree loss, hail damage, and significant property damage.

The 'damage estimate formula' estimates potential losses for the planning area per year based upon historical data:

$$\textbf{Average Annual Damages } (\$\mathbf{176,471}) = \frac{Total\ Damages\ in\ Dollars\ (\$3{,}000{,}000)}{Total\ Years\ of\ Record\ (17)}$$

$$\textbf{Annual Frequency of Hazard Event } (\mathbf{22}\ \boldsymbol{per\ year}) = \frac{Total\ Events\ Recorded\ (382)}{Total\ Years\ of\ Record\ (17)}$$

The average damage per event estimate was determined based upon the average damage per event since 1996 and the number of historical occurrences. This does not include loss of displacement, functional downtime, economic loss, injury, or loss of life. It should be noted that the total crop damages were included in the event details to express the magnitude of the event, but were not calculated into the average damage per event estimate, as crop damages would likely not affect the area.

VULNERABILITY ASSESSMENT

Severe thunderstorms and hail occur on an annual basis, and can equally affect the entire planning area. Severe thunderstorms can produce heavy rain, flooding, damaging hail, lightning, and high winds during and after the event. All building stock and infrastructure including critical facilities, vehicles, power lines, trees, and utilities are at risk of being damaged or affected by severe thunderstorms. According to climate data, May and June have the greatest amounts of rainfall. This coincides with severe thunderstorms and increased tornado activity during these months.

Hail is another component of severe thunderstorms that can seriously impact residents of mobile homes. Nebraska is one of the three states that receive the highest number of hail events annually. Hail can damage vehicles, roofs, and landscaping, as well as cause injury and occasionally death.

FUTURE DEVELOPMENT AND VULNERABILITY

Building codes can be enhanced so that they require or recommend the use of hail resistant material. Existing structures can also incorporate hail resistant products such as concrete roof tiles and siding. CFs should install and utilize surge protectors to ensure continuity of vital services. Power lines can be buried to decrease the chance of prolonged power outage and saferooms can be constructed near vulnerable populations (schools, daycares, mobile home parks, etc.) to increase safety for residents in those areas. Communities can also establish Tree Boards and tree ordinances to ensure urban canopies are safe and healthy, reducing the potential impacts of severe thunderstorms.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that H3 hail events are likely annually, but do not cause as much property damage as severe winter weather. While NCDC does collect damages from hail events it is likely that some damages may be missed or minor damages go unreported.

MITIGATION ALTERNATIVES

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of severe thunderstorms. Many of these strategies are identified and discussed in greater detail in the FEMA document, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*

- Install and maintain surge protection for CFs
- Incentive programs to encourage the use of hail resistant roofing materials for new and existing structures
    - Identified as a mitigation strategy to be implemented by multiple communities
- Bury overhead power lines
    - Many communities have a portion of powerlines buried but there is still a great need across the planning area
- Establish a Tree Board to assist in the development of a tree management program
- Participate in Tree City USA; establish a tree maintenance ordinance
    - Refer to Section 7 for individual communities participation
- Establish redundancies for necessary municipal services (i.e. water, gas, electric, transportation)
    - This varies from jurisdiction to jurisdiction

- Establish data recovery program and backup program for municipal employees
- Establish community severe weather warning protocols
    - Included in the Local Emergency Operations Plans (LEOP)
- Incorporate text messaging into severe weather messaging programs
    - Both County EMAs utilize text alerts
- Incorporate cable TV interruption warning systems
    - Utilized within the communities
- Purchase and issue weather radios to CFs and vulnerable populations
    - This is an ongoing project for many communities
- Establish mutual aide agreements with neighboring communities and privately owned businesses
    - In place for a majority of participants
- Develop business continuity plans for critical community services (public and private)
- Establish public education programs to increase awareness of the dangers posed by severe thunderstorms and ways the public can mitigation the potential impacts
    - County EMAs offer materials related to regional hazards

Flooding (Riverine and Flash)

HAZARD PROFILE

Flood events are the most damaging and costly hazards in the United States, and account for 90% of all presidential disaster declarations. Flooding can occur on a local level, sometimes affecting only a few streets, but can also extend throughout an entire district, affecting whole drainage basins and impacting property in multiple states. The principal type of flood most common to Nebraska, due to geographic location and topography, is riverine floods.

Riverine floods, slower in nature, occur when water from sustained rainfall or rapid snow melt overflows a waterway once the volume of water exceeds the capacity of the waterway. Flash floods, faster in nature, result from convective precipitation usually due to intense thunderstorms or sudden release from an upstream impoundment created behind a dam, landslide, or levee. Flash floods are distinguished from a regular flood by a timescale less than six hours. Flooding from excessive rainfall in Nebraska usually occurs between late spring and early fall.

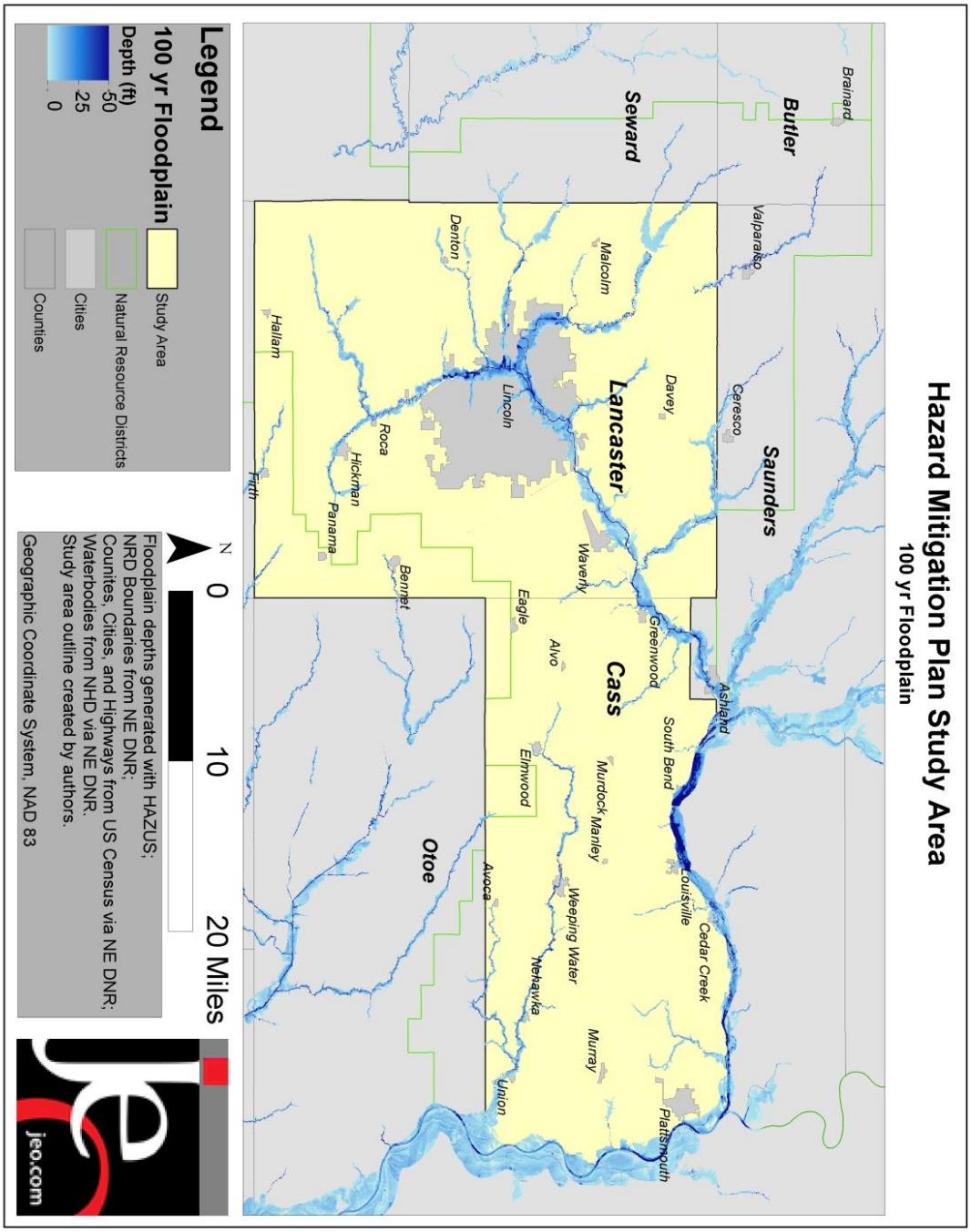
Flooding is most commonly caused by excessive rainfall or snowmelt, but unexpected drainage obstructions such as landslides, ice, or debris can cause slow flooding upstream of the obstruction. Ice jams can cause flooding when a warm snap breaks up river ice, which flows downstream, and piles up against bridges or other waterway obstructions, causing a temporary dam in the waterway with water backing up behind it. When an ice jam breaks, all of the backed-up water is suddenly released, causing a rush of water downstream which can rapidly exceed the capacity of waterways and cause severe flash flooding. Ice jams are common throughout Nebraska during the transition between winter and spring.

Flash floods are rapid flooding of geomorphic low-lying areas, when the ground becomes saturated with water that has fallen too quickly to be absorbed. They are usually caused by heavy rains associated with a severe thunderstorm. Flash floods can also occur after the collapse of an ice jam, or a man-made structure, such as a dam or levee. Flash floods most often occur in normally dry areas that have recently received precipitation. Flash floods are extremely dangerous because of their sudden nature.

At the time of the plan, all incorporated jurisdictions had a delineated 1% annual floodplain.

Jurisdictions with a delineated 1% annual floodplain, generally due to the presence and close proximity of a significant floodway, are more vulnerable to riverine and flash flooding. The potential for localized low-land flooding, especially flash floods with heavy rains, for properties in or near low-lying areas as well as areas where drainage is inadequate is still present for rural areas of the County without a delineated 1%-annual floodplain.

Figure 25: LPSNRD 1% Annual Floodplain Coverage



EXTENT

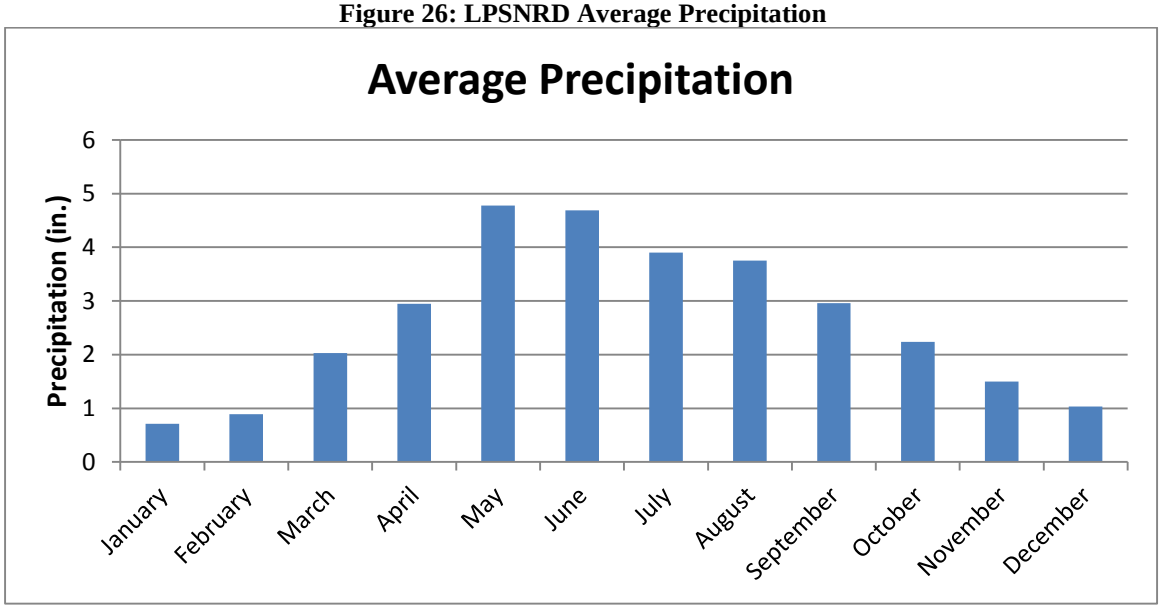
The NWS has three categories to define the severity of a flood once a river reaches flood stage.

Table 24: Flood Definitions

Minor Flooding	Minimal or no property damage, but possible some public threat or inconvenience
Moderate Flooding	Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary
Major Flooding	Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations

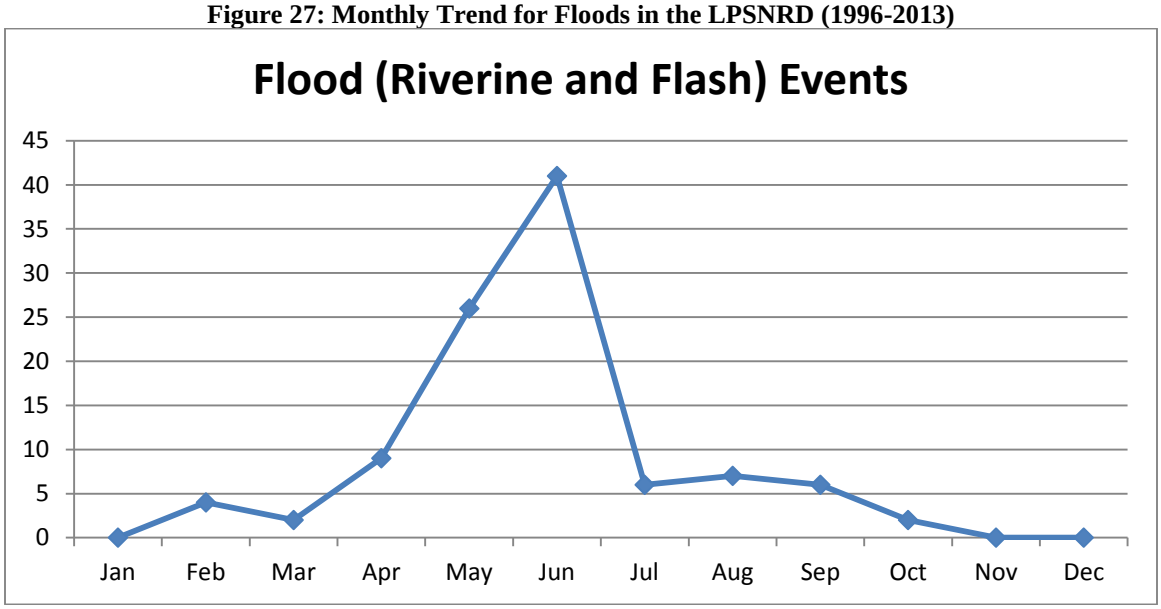
Source: NWS

Figure 26: LPSNRD Average Precipitation



Source: The Weather Channel (weather.com)

Figure 27: Monthly Trend for Floods in the LPSNRD (1996-2013)



Source: NOAA

Based on the historic record it is likely that any flooding that does occur will be minor. The most common months for flooding within the planning area are May and June. These months also happen to be when the planning area gets most of its precipitation.

NFIP

The NFIP was established in 1968 to reduce flood losses and disaster relief costs by guiding future development away from flood hazard areas where feasible by requiring flood resistant design and construction practices and by transferring the costs of flood losses to the residents of floodplains through flood insurance premiums.

In return for availability of federally backed flood insurance, jurisdictions applying to join the NFIP must agree to adopt and enforce minimum flood loss reduction standards to regulate proposed development in SFHA as defined by the FEMA flood maps. One of the strengths of the program has been keeping people away from

flooding rather than keeping the flooding away from people - through historically expensive flood control projects.

The NFIP has approximately 4.4 million policies in force, representing over $370 billion worth of coverage, in 19,884 participating jurisdictions nationwide. Ninety-five percent of flood insurance policies are written by private companies and sold by more than 110,000 insurance agents and brokers participating in the NFIP's Write Your Own (WYO) program. Since 1969, over $12.1 billion in claims have been paid.

Currently, Nebraska has 13,300 policies in force representing $1.3 billion worth of coverage. The planning area has 2,817 policies in force totaling $529,917,700 worth of coverage. Tables 25 and 26 summarize NFIP participation and active policies within the planning area.

Table 25: NFIP Status - December 2012

Jurisdiction	Eligible-Regular Program	Date Current Map	CRS	Sanction	Suspension	Rescinded	Participation in NFIP
Alvo		11/26/2010					No
Ashland	11/03/1982	04/05/2010					Yes
Avoca	08/03/1979	11/26/2010					Yes
Bennet	03/02/1981	04/16/2013					Yes
Brainard		08/16/2011					No
Cass County RWD #1	NA	(see Cass County)					
Cass County RWD #2	NA	(see Cass County)					
Cass County SID #6 (Lake WaConDa)	NA	(see Cass County)					
Cedar Creek	09/15/1978	11/26/2010	In Progress				Yes
Ceresco	07/03/1986	04/05/2010 04/16/2013					Yes
Davey		04/16/2013					No
Denton	09/21/2001	04/16/2013					Yes
Eagle	8/26/1977	11/26/2010				8/26/1977	Yes
Elmwood		11/26/2010					No
Firth	04/15/1981	04/16/2013					Yes
Greenwood	06/03/1980	11/26/2010					Yes
Hallam		04/16/2013					No
Hickman	02/03/1982	04/16/2013					Yes
Lancaster County SID #6 (Emerald)	NA	(see Lancaster County)					
Lancaster County RWD #1	NA	(see Lancaster County)					
Lincoln	04/23/1971	04/16/2013	Yes				Yes
Louisville	03/04/1980	11/26/2010	In Progress				Yes

Jurisdiction	Eligible-Regular Program	Date Current Map	CRS	Sanction	Suspension	Rescinded	Participation in NFIP
LPSNRD	NA	(See Counties)					
Malcolm	03/30/2009	04/16/2013					Yes
Manley		11/26/2010					No
Murdock		11/26/2010					Yes
Murray	01/05/1978	11/26/2010					Yes
Nehawka	02/15/1978	11/26/2010					Yes
Panama		04/16/2013					No
Plattsmouth	03/01/1978	11/26/2010					Yes
Raymond	04/18/1985	04/16/2013					Yes
Roca		04/16/2013				09/30/1998	No
South Bend	07/20/1984	11/26/2010					Yes
Sprague	09/21/2001	04/16/2013					Yes
Union	04/03/1978	11/26/2010					Yes
Valparaiso	06/03/1986	04/05/2010					Yes
Waverly	04/15/1982	04/16/2013					Yes
Weeping Water	12/01/1977	11/26/2010					Yes
Cass County	09/02/1982	11/26/2010	In Progress				Yes
Lancaster County	02/03/1982	02/18/2011					Yes

Source: NDNR, *NFIP*

Table 26: NFIP Policies - December 2012

Jurisdiction	Policies In-Force	Insurance In-Force Whole	Written Premium In-Force
Alvo	N/P	N/P	N/P
Ashland	15	$3,313,300	$10,617
Avoca	0	0	0
Bennet	4	$933,300	$3,762
Brainard	N/P	N/P	N/P
Cass County RWD #1	N/A	N/A	N/A
Cass County RWD #2	N/A	N/A	N/A
Cass County SID #6 (Lake WaConDa)	N/A	N/A	N/A
Cedar Creek	143	$20,065,300	$141,341
Ceresco	0	0	0
Davey	N/P	N/P	N/P
Denton	0	0	0
Eagle	0	0	0

Jurisdiction	Policies In-Force	Insurance In-Force Whole	Written Premium In-Force
Elmwood	N/P	N/P	N/P
Firth	3	$237,700	$623
Greenwood	0	0	0
Hallam	N/P	N/P	N/P
Hickman	30	$3,402,800	$28,402
Lancaster County SID #6 (Emerald)	N/A	N/A	N/A
Lancaster County RWD #1	N/A	N/A	N/A
Lincoln	1,931	$353,281,300	$1,778,987
Louisville	43	$6,103,900	$30,275
Malcolm	3	$577,000	$1,741
Manley	N/P	N/P	N/P
Murdock	N/P	N/P	N/P
Murray	0	0	0
Nehawka	13	$1,249,200	$11,172
Panama	N/P	N/P	N/P
Plattsmouth	63	$10,818,900	$56,793
Raymond	2	$73,000	$431
Roca	N/P	N/P	N/P
South Bend	23	$3,774,500	$12,412
Sprague	3	$212,000	$2,130
Union	1	$280,000	$343
Valparaiso	1	$140,000	$1,331
Waverly	110	$29,796,100	$85,111
Weeping Water	13	$2,255,500	$11,686
Cass County	374	$81,724,600	$219,341
Lancaster County	42	$6,676,300	$33,555
LPSNRD	2,817	$529,917,700	$2,430,194

N/P: Non-Participant; N/A: Not Applicable.
Source: NDNR, NFIP

This plan highly recommends and strongly encourages each plan participant to remain in good standing and continue involvement with the NFIP. Compliance with the NFIP should remain a top priority for each participant. Jurisdictions are encouraged to initiate activities above the minimum participation requirements, which are described in the CRS Coordinator's Manual (FIA-15/2013).

Another innovative program is FEMA's Cooperating Technical Partners Program (CTP). The main objective of CTP is to increase local involvement in the flood mapping process. With over 20,000 jurisdictions in the NFIP, the CTP encourages collaboration with NFIP jurisdictions and regional and state agencies who wish to become more active participants in the FEMA flood hazard mapping program.

In order to qualify for HMA, plan participants must have a good standing in NFIP if the project is located in a Flood Hazard Risk Area. Contact the NDNR for any questions regarding NFIP.

NFIP Repetitive Loss Structures

The NDNR was contacted to determine if any existing buildings, infrastructure, or CFs are classified as NFIP Repetitive Loss Structures. According to the NDNR, the planning area has 39 Single Family and 5 Non-residential NFIP Repetitive Loss Structures (as of January 2014).

Table 27: Repetitive Loss Properties

Community	Single Family	Non-residential
Ashland	2	1
Cass County	21	2
Cedar Creek	6	0
Lancaster County	1	0
Lincoln	1	1
Louisville	2	0
Nehawka	4	1
Weeping Water	2	0
Total	**39**	**5**

Average Annual Damages and Frequency

Flooding can occur on an irregular basis with varying magnitudes and can cause a wide range of damage. However, based on the historic record it is likely that any flooding that does occur will be minor.

The 'damage estimate formula' estimates potential losses for the planning area per year based upon historical data:

$$\textbf{Average Annual Damages } (\$\mathbf{196,882}) = \frac{Total\ Damages\ in\ Dollars\ (\$3{,}347{,}000)}{Total\ Years\ of\ Record\ (17)}$$

$$\textbf{Annual Frequency of Hazard Event } (\mathbf{3}\ \boldsymbol{per\ year}) = \frac{Total\ Events\ Recorded\ (59)}{Total\ Years\ of\ Record\ (17)}$$

Historical Occurrences

The NCDC reports 59 flooding events from 1996 to 2013. Of these 59 events 38 are flash flooding and 21 are riverine flooding. According to the NCDC flash flooding resulted in $3,347,000 in property damages and $55,000 in crop damage. Riverine flooding caused $1,830,000 in property damages and no crop damages.

No additional historical occurrences or records of damages from flooding were discovered after discussion with the planning team, and residents. The events below were significant in loss of life, injuries, or the amount of damages.

- June 21, 2010: In the village of Avoca the creek flooded and water was standing on the streets. The flooding caused damage to the Village Wastewater Plant, bridges, parks, and some residential buildings.
- September, 2010: In the city of Weeping Water the campgrounds and its amenities and park facilities flooded.
- 2011: Missouri river flooding.
- June/July, 2011: Flooding along the Missouri and Platte Rivers caused property damage to residents on lots in Buccaneer Bay along the Platte River and Four Mile Creek. No damage was caused to the water and wastewater infrastructure, though a number of preventative steps were required, such as plugs in manhole covers.

- June 4, 2013: In the city of Hickman large flood that filled basements and impacted the first floor of structures in the floodplain. It also largely impacted the city of Hickman Main Park.
- May 29, 2013: In the village of Ceresco a flooding event occurred that flooded the bridges and highways and disturbed traffic for several hours.

HAZUS 1% FLOOD ANALYSIS

A HAZUS-MH 1% flood scenario was created for the planning area. This scenario was run utilizing the data included within the HAZUS software, much of which is from the 2000 Census. This data also includes buildings, but that data is not as current or complete as local assessor data. It should be noted that the scenario below is limited by the quality of the base data utilized. The information from the HAZUS-MH assessment for the area is summarized below.

Table 28: Building Damage by Percent Damages in Thousands of Square Feet

County	Degree of Damage							Total Damaged
	None	1-10%	11-20%	21-30%	31-40%	41-50%	Substantial	
Cass	524.06	12.05	90.11	82.96	124.55	184.68	394.28	888.63
Lancaster	2848.71	690.51	2527.34	1631.71	1669.75	1511.75	1589.07	9620.13

Table 29: Building Damage by Occupancy in Thousands of Square Feet

County	Agricultural		Commercial		Government		Industrial		Residential		All		Percent Substantial	Percent of Total
	Sub.	Total	Sub.	Total	Sub.	Total	Sub.	Total	Sub.	Total	Sub.	Total		
Cass	1.2	11.1	18.4	117.2	0.2	4.4	6.5	29.7	367.6	713.6	394.3	888.7	27.9%	62.9%
Lancaster	9.9	67.0	233.3	3176.3	7.7	147.4	308.5	1848.3	1019.6	6636.4	1589.1	12468.8	12.7%	77.2%

Table 30: Building Damage by Percent Damages in Numbers of Buildings

County	Degree of Damage							Total Damaged
	None	1-10%	11-20%	21-30%	31-40%	41-50%	Substantial	
Cass	254	0	3	10	18	54	150	235
Lancaster	814	4	50	87	238	388	470	1237

Table 31: Building Damage by Occupancy Category in Numbers of Buildings

County	Residential		All		% Substantial	% of Total
	Substantial	Total	Substantial	Total		
Cass	150	235	150	235	30.6	47.9
Lancaster	471	1206	473	1264	23.3	60.1

Table 32: Direct Economic Losses from Buildings in Thousands of Dollars

County	Capital Stock Losses			Income Loss				Total Loss	% of Total
	Cost Structural Damage	Cost Contents Damage	Inventory Loss	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss		
Cass	37,714	28,268	700	52	21	39	11	66,805	9.9
Lancaster	260,583	406,914	29288	439	917	2220	229	700,590	10.3

Table 33: Shelter Requirements

County	Number of Displaced People	Number of People Needing Short Term Shelter
Cass	1,291	611
Lancaster	14,763	12,514

SUPPLEMENTAL ANALYSIS

As the tables above illustrate, a 1% annual flood has the potential to cause significant amounts of damage within the planning area. These damages include: economic impacts of around 10% of capital stock and income; the need to shelter almost 17,000 individuals; substantial damage to just below 1/3 of all buildings; and minor damages to many more buildings.

VULNERABILITY ASSESSMENT

A 2008 study examining social vulnerability as it relates to flood events found that low-income and minority populations are disproportionately vulnerable to flood events. These groups may lack resources that are needed to mitigate potential flood events as well as resources that are necessary for evacuation and response. In addition, low income residents are more likely to live in areas vulnerable to the threat of flooding, but lack the resources necessary to purchase flood insurance. The study did find that flash floods are more often responsible for injuries and fatalities than prolonged flood events. Other groups that may be more vulnerable to floods, specifically flash floods, include the elderly, those outdoors during rain events, and those in low-lying areas. Elderly residents may suffer from a decrease or complete lack of mobility and as a result, be caught in flood-prone areas. Residents in campgrounds or public parks may be more vulnerable to flooding events as many of these areas exist in natural floodplains and can experience rapid rise in water levels resulting in injury or death.

FUTURE DEVELOPMENT AND VULNERABILITY

Land-use regulations should be used to limit development in floodplains and other flood prone areas as well as protecting natural flood mitigation features. Buyout programs can be used to eliminate properties located in floodplains, especially properties that have experienced repetitive losses. Communities may also consider incorporating "Green Infrastructure" to address flooding concerns, examples of this would include using permeable surfaces for parking areas, using rainwater retention swales, developing rain gardens, developing green roofs, and establishing greenways. The city of Lincoln has four buildings that have installed green roofs. Three of the buildings are located in the downtown part of the city and help to reduce the runoff, while the fourth building is located at Pioneers Park in the southwest part of the city. The city, University of Nebraska-Lincoln, and LPSNRD completed the Antelope Valley project to remove 1,000 structures from the 1% annual floodplain and add green space. Building codes can be enhanced to require tie-down straps for propane tanks while existing structures can be retrofitted to withstand potential flood events elevating structures and utilities.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that flooding is likely to occur annually and could have moderate impacts. Although there is not a great history of flooding, the number of parcels and CFs located in A and AE zones creates the potential for greater impacts in the future. The HAZUS scenario did not indicate catastrophic losses, but the area has experienced growth since 2000, the year on which the HAZUS data is based. Although this hazard is less of a concern to the local planning team than most other natural hazards, it would appear to pose a greater threat than a hazard such as wildfire.

MITIGATION ALTERNATIVES

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of flooding. Many of these strategies are identified and discussed in greater detail in the FEMA document, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*.

- Limit or restrict development in flood-prone areas
    - Most communities with floodplain areas have limited development in those areas and more severely restricted development within the floodway
- Preserve natural open spaces in floodplains
    - Many communities identified this as an ongoing project
- Incorporate permeable surfaces and other "green infrastructure" components into municipal designs; establish a "green infrastructure" program
- Enhanced building codes (i.e. require tie-downs for propane tanks and other gas and chemical storage containers; require water detention swales and retention ponds for new construction)
    - This is not standard within the planning area
- Revise and update floodplain maps
    - NDNR works with many communities in this effort
- Manage the Floodplain Beyond Minimum Requirements (i.e. adopting a "no-rise" in base elevation clause for the flood damage prevention ordinance)
    - The minimum standard for Nebraska requires all new construction to be build one foot above base flood elevation (BFE) or a one foot free board
- Participate in the NFIP
    - See list provided
- Encourage property owners in areas protected by dams and levees to purchase flood insurance
- Participate in the NFIP's CRS
    - City of Lincoln is currently a Level 6 community; Cass County, Cedar Creek , and Louisville are currently in the process of joining the CRS program
- Remove existing structures from flood-prone areas
    - This is an ongoing process for communities with structures in the floodplain
- Elevate or retrofit structures and utilities
- Incorporate ice jam prevention techniques into mitigation strategies and projects
- Develop incentives for structural floodproofing
    - This is not standard within the planning area
- Consider erosion control and bank stabilization programs for CFs
- Retain natural vegetative beds in stormwater channels
- Incorporate flood mitigation programs into comprehensive plans
    - Many comprehensive plan in the planning area identify the floodplain and outline growth objective related to the area
- Construct flood control measures
    - This is applicable for a small number of communities
- Evaluate and update municipal storm water systems
    - Identified as a mitigation project by many communities within the planning area
- Develop flood response plans for the community (incorporating information about pet and agricultural animal considerations)
    - County LEOPS address this area
- Establish education programs to educate the public about the risks of flooding and ways to protect their families and property
    - County EMAs offer materials related to regional hazards

Extreme Heat

HAZARD PROFILE

Extreme heat is often associated with periods of drought, but can also be characterized by long periods of high temperatures in combination with high humidity. During these conditions, the human body has difficulties cooling through the normal method of the evaporation of perspiration. Health risks arise when a person is overexposed to heat. Extreme heat can also cause people to overuse air conditioners, which can lead to power failures. For the planning area, the months with the highest temperatures are May, June, July, August, and September. The NWS is responsible for issuing excessive heat outlooks, excessive heat watches, and excessive heat warnings. Excessive heat outlooks are issued when potential exists for an excessive heat event in the next 3 to 7 days. Excessive heat outlooks can be utilized by public utility staffs, emergency managers, and public health officials to plan for extreme heat events. Excessive heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. An excessive heat watch should provide local officials and residents in the area enough time to take appropriate actions to mitigate the effects of extreme heat. Finally, excessive heat warnings are issued when an excessive heat event is expected in the next 36 hours. Excessive heat warnings are issued when an extreme heat event is occurring, is imminent, or has a very high probability of occurring.

EXTENT

Another factor in extreme heat situations is the humidity level relative to the temperature. As is indicated in Figure 28, as the Relative Humidity increases, the temperature needed to cause a dangerous situation decreases. For example, for 100% Relative Humidity dangerous levels of heat begin at 86°F where as a Relative Humidity of 50%, requires 94°F. The combination of Relative Humidity and Temperature result in a Heat Index: 100% Relative Humidity + 86°F = 112° Heat Index.

Figure 28: NOAA Heat Index

NOAA's National Weather Service

Heat Index

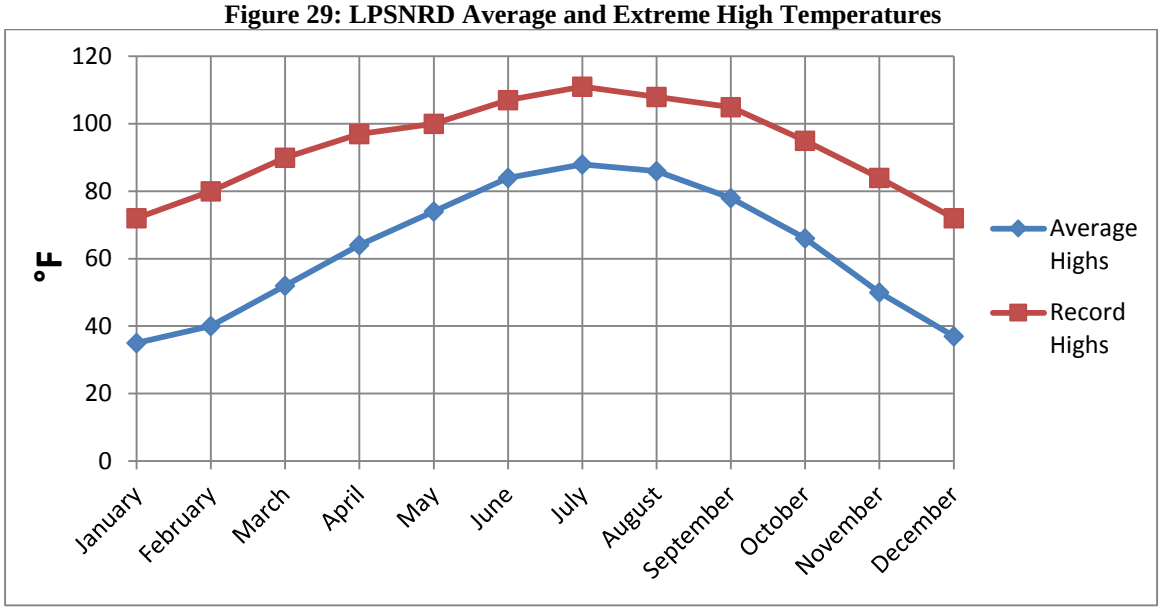
Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

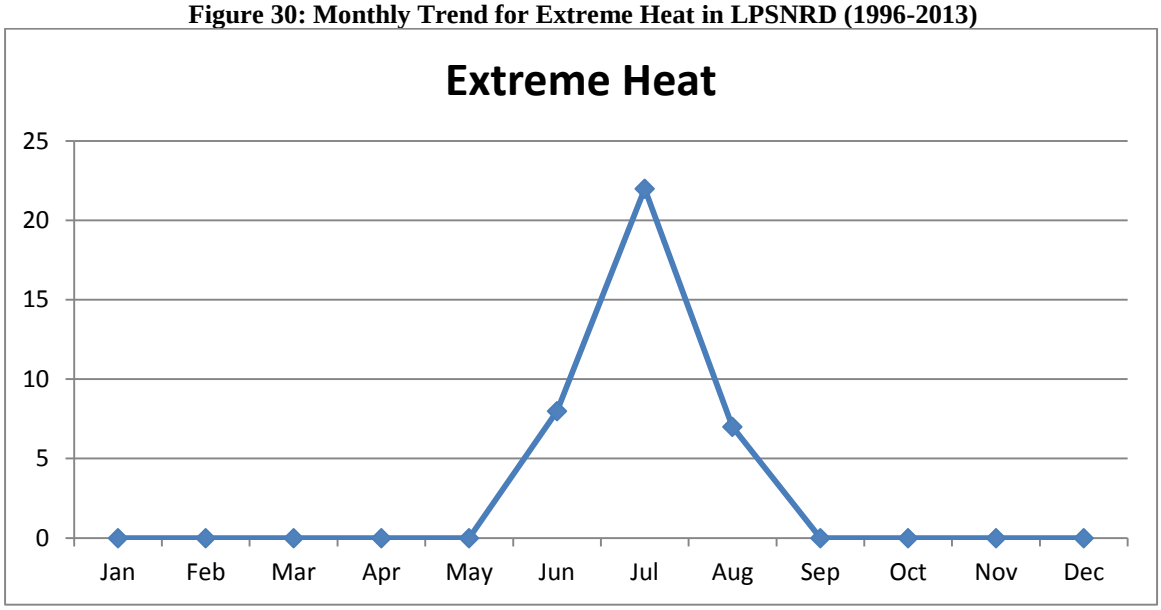
Caution | Extreme Caution | Danger | Extreme Danger

Figure 29: LPSNRD Average and Extreme High Temperatures



Source: The Weather Channel (weather.com)

Figure 30: Monthly Trend for Extreme Heat in LPSNRD (1996-2013)



Source: NOAA

Extreme heat events will be most likely to occur in June, July, and August, when temperatures reach their maximum each year. The real danger with extreme heat is not the day time temperature, but the night time temperatures not falling and remaining humid throughout the night.

Historical Occurrences

While there are no events with death, injuries, or losses reported by the NCDC, the High Plains Regional Climate Center reports approximately 41 days annually where temperatures greater than 90°F occur in the planning area. An extreme heat and drought event from the summer of 2012 was substantial, but did not warrant a presidential disaster declaration within Nebraska. The full effects of this event are still being assessed, and any future update should include details about its true extent.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

The direct and indirect effects of extreme heat are difficult to quantify. There is no way to place a value on the loss of human life. Potential losses such as power outages could affect businesses, homes, and CFs. High demand and intense use of air conditioning can overload the electrical systems and cause damages to infrastructure.

Due to the limited reports of historical occurrences with recorded damages, it is not feasible to utilize the 'event damage estimate formula' to estimate potential losses for the planning area.

According to the FEMA publication "*What is a Benefit: Guidance on Benefit-Cost Analysis of Hazard Mitigation Project (June 2009)*", if an extreme heat event occurred within the planning area, the table below assumes the event could potentially cause a loss of electricity for 10% of the population at a cost of $126 per person per day. In rural areas, the percent of the population affected and duration may increase during extreme events. The assumed damages do not take into account physical damages to utility equipment and infrastructure.

Table 34: Loss of Electricity - Assumed Damage by Jurisdiction

Jurisdiction	2010 Population	Population Affected (Assumed)	Electric Loss of Use Assumed Damage
Alvo	132	13	$1,663
Ashland	2,453	245	$30,908
Avoca	242	24	$3,049
Bennet	719	72	$9,059
Brainard	330	33	$4,158
Cedar Creek	390	39	$4,914
Ceresco	889	89	$11,201
Davey	154	15	$1,940
Denton	190	19	$2,394
Eagle	1,024	102	$12,902
Elmwood	634	63	$7,988
Firth	590	59	$7,434
Greenwood	568	57	$7,157
Hallam	213	21	$2,684
Hickman	1,657	166	$20,878
Lincoln	258,379	25838	$3,255,575
Louisville	1,106	111	$13,936
Malcolm	382	38	$4,813
Manley	178	18	$2,243
Murdock	236	24	$2,974
Murray	463	46	$5,834
Nehawka	204	20	$2,570
Panama	256	26	$3,226
Plattsmouth	6,502	650	$81,925
Raymond	167	17	$2,104
Roca	220	22	$2,772
South Bend	99	10	$1,247

Jurisdiction	2010 Population	Population Affected (Assumed)	Electric Loss of Use Assumed Damage
Sprague	142	14	$1,789
Union	233	23	$2,936
Valparaiso	570	57	$7,182
Waverly	3,277	328	$41,290
Weeping Water	1,050	105	$13,230
Cass County	25,241	2524	$318,037
Lancaster County	285,407	28541	$3,596,128
LPSNRD	**594,297**	**59430**	**$7,488,142**

Source: FEMA

VULNERABILITY ASSESSMENT

The months of July and August are when most extreme heat events occur. These months also have lower amounts of precipitation, thus increasing the possibility for a drought event. Periods of high temperatures can make people vulnerable to heatstroke, heat cramps, heat exhaustion, and pose a threat to human life. Most at risk are young children, elderly, and those working and living in non-air-conditioned environments. Building stock, such as CFs, are not at risk, however periods of extreme heat place a significant demand on utilities, such as water and electricity that can cause a failure in the system. Power loss could occur with the high demand on energy, making an extreme heat event even more dangerous.

The agricultural economy, especially livestock, is highly vulnerable and at great risk during periods of extreme heat. Heat stress in feedlot cattle can cause reduced performance, and in the most severe cases, death of the animals, resulting in millions of dollars in losses to the cattle industry. According to the 2013 American Community Survey five-year estimates, agriculture represents 1.4% of the planning area's workforce.

All segments of the population are vulnerable to the effects of extreme heat, some specific groups have higher levels of vulnerability to extreme heat include the elderly (65 years and older), residents of nursing homes or care facilities, children, those isolated from social interactions, and low-income groups. Elderly residents and people living in nursing homes and care facilities have less tolerance for temperature extremes and can quickly feel the effects of extreme temperatures. Low-income elderly in urban areas are especially at risk from extreme temperatures. Young children under the age of 5 are highly susceptible to the effects of extreme heat. Young children have a smaller body mass to surface ratio making them more vulnerable to heat-related morbidity and mortality. Children also become dehydrated more quickly than adults making for greater concern. Low-income people and families may lack resources that mitigate the impacts of extreme heat such as air conditioning.

FUTURE DEVELOPMENT AND VULNERABILITY

Communities will always have some level of vulnerability related to extreme heat events. Any future development and future residents in the planning are will be vulnerable to the affects and losses sustained from extreme heat, especially the agricultural economy. The total losses that could occur in the future would increase as the population of the City increases. The education of the population is the best way to mitigate for extreme heat. There are few large scale "hard" projects that can be undertaken, but explaining policies and best practices can go a long way in dealing with this hazard. It is especially advisable to educate vulnerable populations. Elderly residents are often in the greatest danger when it comes to extreme heat. Children are also more vulnerable to extreme temperatures.

Communities can incorporate some strategies to reduce these impacts including: cool roofing materials, planting trees and vegetation, incorporating green roofs into urban design, and using cool pavements. Cool roof products are made of highly reflective and emissive materials that can remain approximately 50 - 60°f cooler than traditional roofing materials during peak summer heat. Trees, shrubs, grass, and ground covers help cool urban environments by providing shade as well as increasing evapotranspiration resulting in cooler temperatures. A green roof is a vegetative layer grown on a rooftop which helps to remove heat from the air through evapotranspiration. Cool pavements are designed to reduce solar energy absorption as well as reducing thermal emittance.

Risk Assessment Summary

Overall, the risk and vulnerability assessment shows that extreme heat has had limited damages and injuries, but has a disproportionate impact on vulnerable populations. The impacts of this hazard are difficult to quantify, but still sufficient to make this a moderately concerning hazard for the planning area.

Mitigation Alternatives

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of extreme heat. Some of these strategies, such as the use of warning systems, are already in place in the planning area. Many of these strategies are identified and discussed in greater detail in the FEMA document, *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*.

- Reduce Urban Heat Island Effect (i.e., using cool roofing products that reflect sunlight and heat away from buildings)
    - This is not a concern for most of the planning area
- Increase Awareness of Extreme Heat Risk and Safety (i.e., educating citizens regarding the dangers of extreme heat and the steps they can take to protect themselves)
    - County EMAs offer materials related to regional hazards
- Assist Vulnerable Populations (i.e., creating a database to track those individuals at high risk such as the elderly)
    - Most communities in the planning area have identified this as an alternative, but have not started this
- Identify Existing Community Shelters/Centers

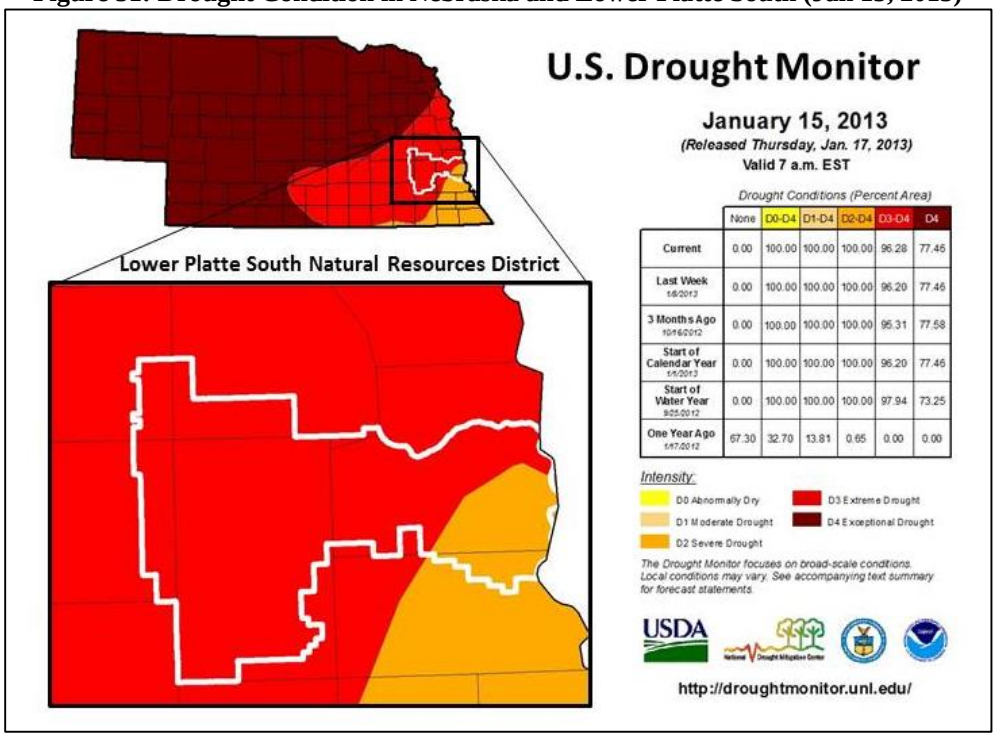
Drought

HAZARD PROFILE

Drought is generally defined as a natural hazard that results from a substantial period with lack of precipitation causing a serious hydrological imbalance. Although many consider it a rare and random event, drought is actually a normal, recurrent feature of climate. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. A drought often coexists with periods of extreme heat, which together can cause significant social stress, economic losses, and environmental degradation.

> *According to the NDMC, "**drought** is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another."*

Figure 31: Drought Condition in Nebraska and Lower Platte South (Jan 15, 2013)



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	96.28	77.46
Last Week 1/8/2013	0.00	100.00	100.00	100.00	96.20	77.46
3 Months Ago 10/16/2012	0.00	100.00	100.00	100.00	95.31	77.58
Start of Calendar Year 1/1/2013	0.00	100.00	100.00	100.00	96.20	77.46
Start of Water Year 9/25/2012	0.00	100.00	100.00	100.00	97.94	73.25
One Year Ago 1/17/2012	67.30	32.70	13.81	0.65	0.00	0.00

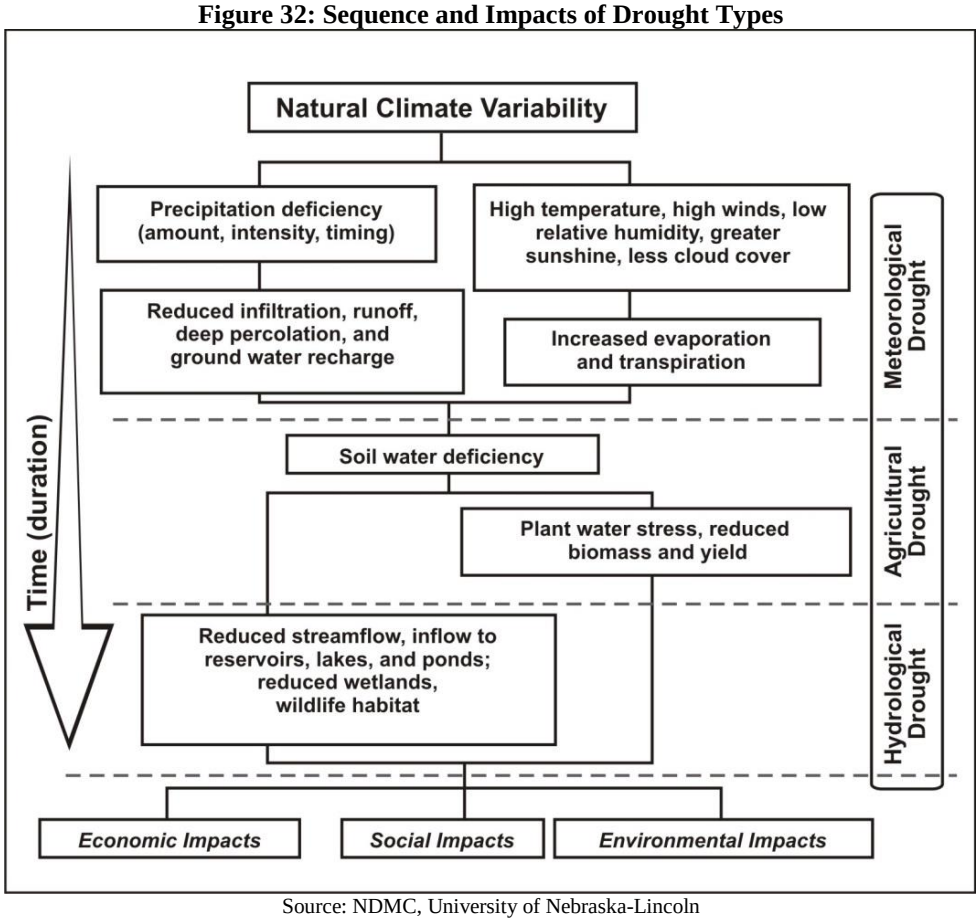
Source: NDMC, Drought Monitor

Drought is a slow-onset, creeping phenomenon and its impacts are largely non-structural. Drought normally affects more people than other natural hazards, and its impacts are spread over a larger geographical area. As a result, the detection and early warning signs of drought conditions, and assessment of impacts, are more difficult to identify than that of quick-onset natural hazards (e.g., flood and storm) that result in more visible impacts. In addition, drought has more than 150 definitions and this lack of a universal definition makes it even harder to decide the onset and end. Generally according to the NDMC, droughts are classified into four major types:

- ***Metrological Drought*** – is defined based on the degree of dryness and the duration of the dry period. Metrological drought is often the first type of drought to be identified and should be defined regionally as precipitation rates and frequencies ("norms") vary.
- ***Agricultural Drought*** – occurs when there is deficient moisture that hinders planting germination, leading to low plant population per hectare and a reduction of final yield. Agricultural drought is closely linked with metrological and hydrological drought, as agricultural water supplies are contingent upon the two sectors.

- ***Hydrologic Drought*** – occurs when water available in aquifers, lakes, and reservoirs falls below the statistical average. This situation can arise even where the area of interest receives average precipitation. This is due to the reserves diminishing from increased water usage, usually from agricultural use or high levels of evapotranspiration resulting from prolonged high temperatures. Hydrological drought often is identified later than metrological and agricultural drought. Impacts from hydrological drought may manifest themselves in decreased hydropower production and loss of water based recreation.
- ***Socioeconomic Drought***– occurs when the demand for an economic good exceeds supply due to a weather-related shortfall in water supply. The supply of many economic goods include, but are not limited to, water, forage, food grains, fish, and hydroelectric power.

Figure 32: Sequence and Impacts of Drought Types

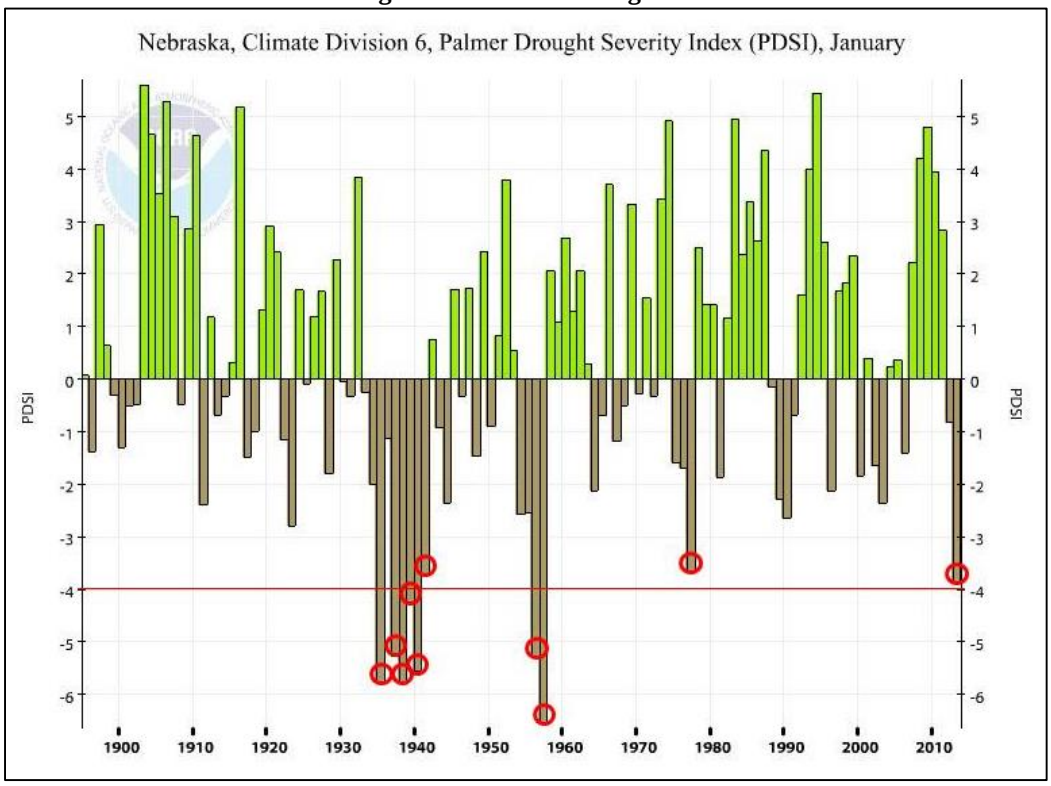


Source: NDMC, University of Nebraska-Lincoln

EXTENT

Due to drought's unique nature and characteristics, it is yet to be decided the best way to predict and monitor drought. Among the several indices, the Palmer Drought Severity Index (PDSI) has been widely used by various governments in the U.S. The USDA uses the U.S. Drought Monitor in determining when to grant emergency drought assistant. Figure 33 shows the PDSI with data from the NCDC. The graph illustrates historical PDSI for Division 6 - East Central Nebraska, which includes the planning area, between the years of 1895 and 2010. The negative Y axis represents a drought, for which '-2' indicates a moderate drought, '-3' a severe drought, and '-4' an extreme drought. Table 35 shows the details of the palmer classifications. According to this dataset, extreme droughts were recorded in 10 years dating back to the 1895 and major events include the Dust Bowl in the 1930s and the recent 2012 drought. Table 36 shows the classification for the Drought Monitor.

Figure 33: Palmer Drought SI



Source: NOAA, High Plains Regional Climate Center

Table 35: Palmer Classifications

Numerical Value	Description	Numerical Value	Description
4.0 or more	Extremely wet	-0.5 to -0.99	Incipient dry spell
3.0 to 3.99	Very wet	-1.0 to -1.99	Mild drought
2.0 to 2.99	Moderately wet	-2.0 to -2.99	Moderate drought
1.0 to 1.99	Slightly wet	-3.0 to -3.99	Severe drought
0.5 to 0.99	Incipient wet spell	-4.0 or less	Extreme drought
0.49 to -0.49	Near normal	--	--

Source: NOAA, NWS, Climate Prediction Center

Table 36: U.S. Drought Monitor Classification

Category	Description	Palmer Classification	Possible Impacts
D0	Abnormally Dry	-1.0 to -1.9	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	-2.0 to -2.9	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	-3.0 to -3.9	Crop or pasture losses likely, water shortages common; water restrictions imposed

Category	Description	Palmer Classification	Possible Impacts
D3	Extreme Drought	-4.0 to -4.9	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	-5.0 or less	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams and wells creating water emergencies.

Source: NDMC, NOAA

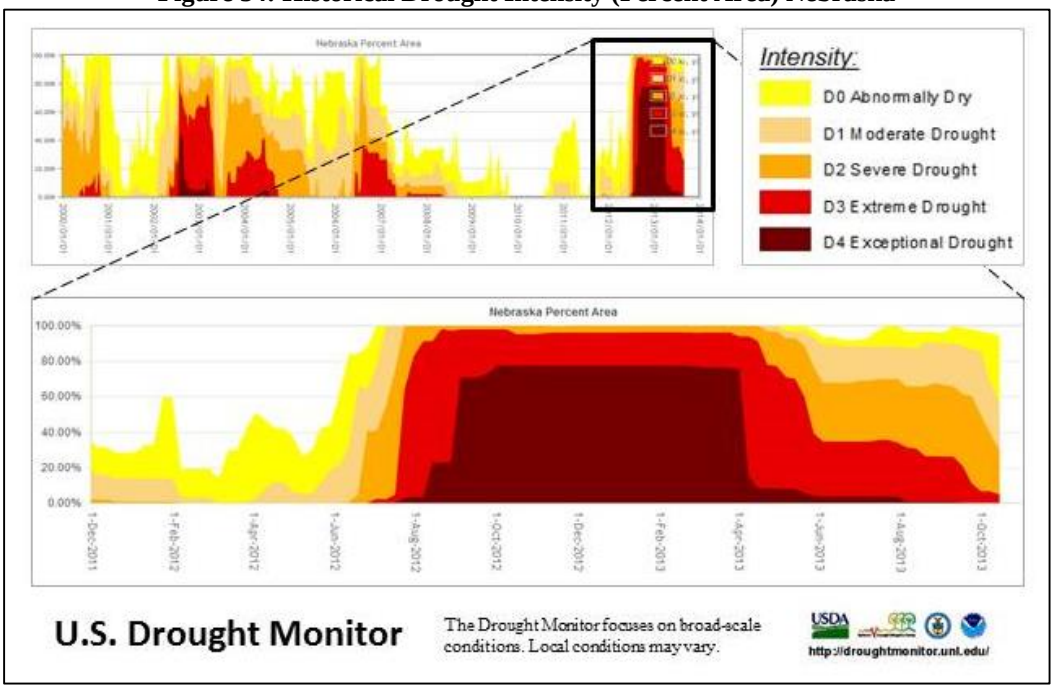
Based on historical records there is a chance for exceptional drought in the planning area.

HISTORICAL OCCURRENCES

The NDMC reported 31 months of at least D3 drought for the planning area from January 1996 to May 2013, including 11 months in 2012 into 2013. None of the reported events incurred recorded fatalities, injuries, or significant monetary damages within the planning area.

The extreme heat and drought event started in the summer of 2012 was substantial, but did not warrant a presidential disaster declaration within Nebraska. Figure 34 summarizes the historical drought conditions for Nebraska by intensity and percent area since 2000. According to the data acquired from NDMC, the whole state of Nebraska was in severe drought conditions from the middle of July in 2012 to the end of May in 2013 and over 70% of the state was in exceptional drought conditions for over eight months. Numerous cities implemented mandatory water restrictions and some encouraged voluntarily water conservation during the period of drought. The full effects of this event are still to be assessed, and any future update should include details about its true extent.

Figure 34: Historical Drought Intensity (Percent Area) Nebraska



Source: NDMC, University of Nebraska-Lincoln

The following drought events were reported by participants at the public meetings:

- 2012 and June to April, 2013: The City of Waverly reported lack of precipitation for at least 9 months.
- 2012: The whole natural resources district was in drought conditions.

The Drought Impact Reporter is a database of drought impacts throughout the United States. The Drought Impact Reporter has recorded a total of 228 drought related impacts throughout Cass and Lancaster County. Table 37 demonstrates the sectors that have previously reported impacts in both the Cass and Lancaster County. Examples of reported drought impacts include:

- Power generation down at power plants on the upper Missouri River (5/2013);
- 500 Nebraska firefighters will receive training in the preparation for another fire season across the state (2/2013); and
- Heat and drought increase demand on utilities in Nebraska (7/2012)

Table 37: Number of Reported Drought Impacts by Sector (January 2003 - October 2013)

County	Agricultural	Business & Industry	Energy	Fire	Plant & Wildlife	Relief, Response, & Restrictions	Society & Public Health	Tourism & Recreation	Water Supply & Quality
Cass & Lancaster	124	31	7	6	27	53	31	4	44

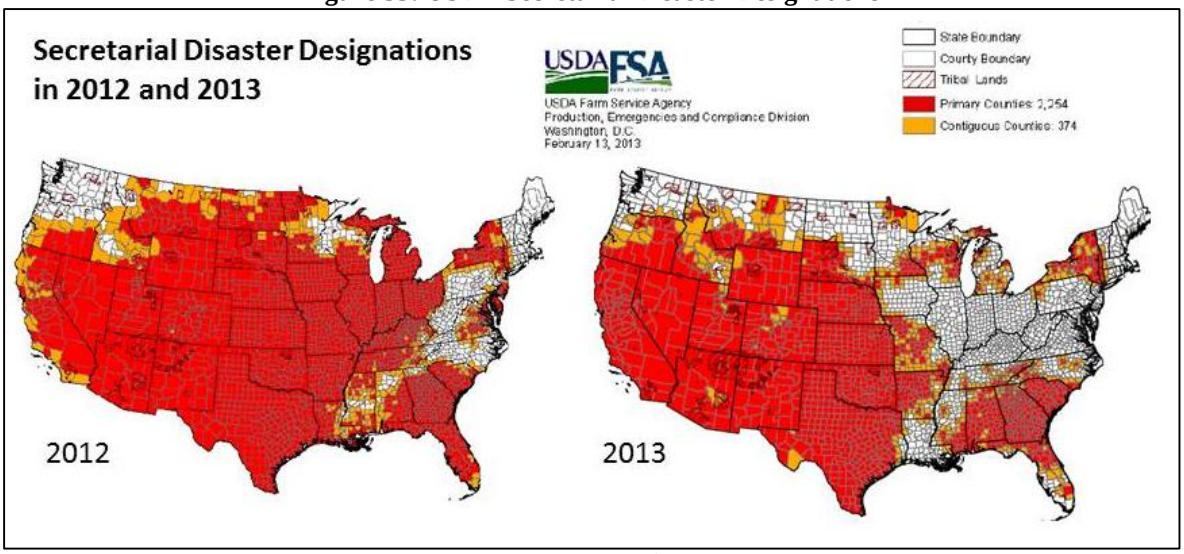
Source: NDMC – Drought Impact Reporter

AVERAGE ANNUAL DAMAGES AND FREQUENCY

Frequency of drought is calculated by the number of months reported as being in D3 drought as recorded by NMDC divided by the total number of months for the period of record (216). This more accurately represents the annual propability for drought. Using this method, the annual probability for drought is approximately 14%.

The severe drought in 2012 significantly affected the agricultural sector of the state. Although the full impacts is yet to be studied, USDA reported a total of $139,957,809 to Nebraska from 2008 to 2011 for all five disaster programs: Supplemental Revenue Assistance Payments (SURE), Livestock Forage Disaster Assistance Program (LFD), and Emergency Assistance for Livestock, Honeybees, Farm-Raised Fish Program (ELAP), Livestock Indemnity Program (LIP), and Tree Assistance Program (TAP). Regarding the planning area, Cass County and Lancaster County received a total of $2,434,671 and $1,204,395 respectively. Figure 37 shows the drought disaster designations by the USDA in 2012 and 2013 and the whole state of Nebraska is in the red zone, indicating that Nebraska, including our planning area, in a drought disaster during the time period shown.

Figure 35: USDA Secretarial Disaster Designations



Source: U.S. Department of Agriculture

VULNERABILITY ASSESSMENT

As identified in Nebraska's Drought Mitigation and Response Plan, drought is a common feature of the Nebraska landscape and often causes significant economic, environmental, and social impacts. Although agriculture is the major sector affected, impacts on rural and municipal water supplies, fish and wildlife, tourism, recreation, water quality, soil erosion, the incidence of wildland fires, electricity demand, and other sectors are also significant. Also, the indirect impacts of drought on personal and business incomes, tax revenues, unemployment, and other areas are also important. In general, drought produces a complex web of impacts that ripple through many sectors of the economy. This is largely due to the dependence of so many sectors on water for producing goods and providing services. It is impossible to predict all the potential impacts, but the common effects of drought have been compiled by the NDMC and are illustrated in Table 38.

Table 38: Classification of Drought-Related Impacts

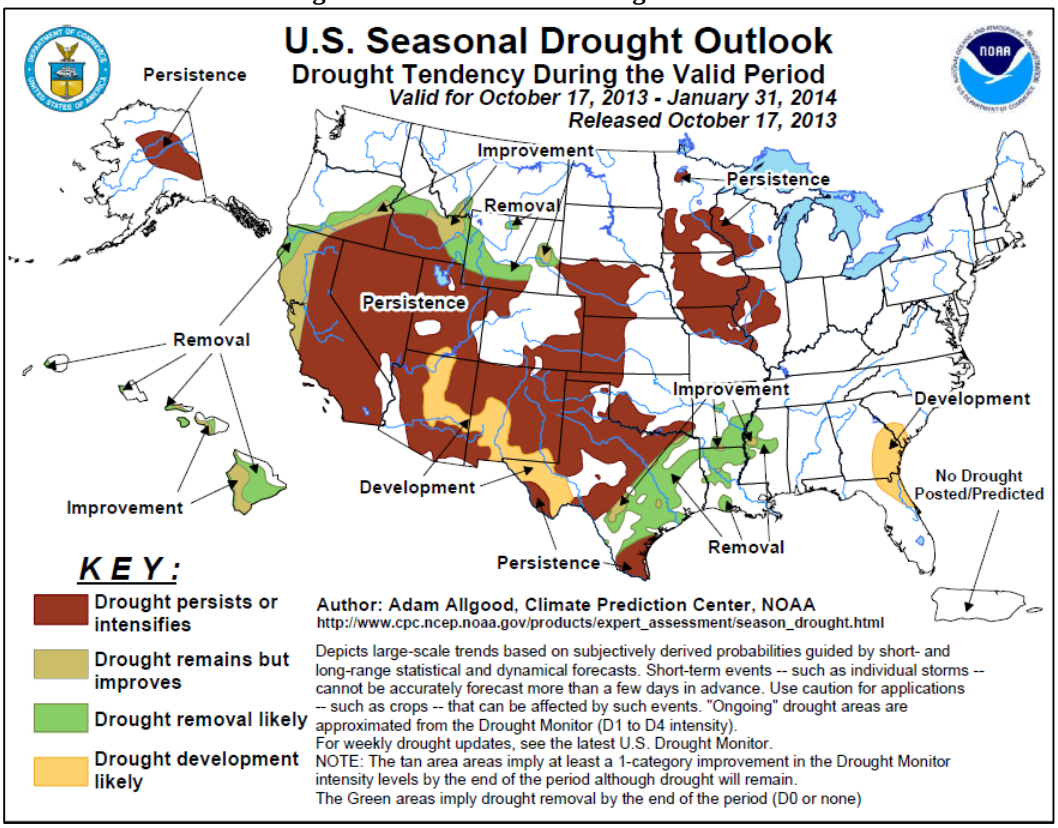
Problem Sectors	Impacts
Economic	○ Loss from crop production Annual and perennial crop losses; damage to crop quality Reduced productivity of cropland (wind erosion, etc.) Insect infestation Plant disease Wildlife damage to crops ○ Loss from dairy and livestock production Reduced productivity of range land Forced reduction of foundation stock Closure/limitation of public lands to grazing High cost/unavailability of water for livestock High cost/unavailability of feed for livestock High livestock mortality rates Increased predation Range fires ○ Loss from timber production Forest fires Tree disease Insect infestation Impaired productivity of forest land ○ Loss from fishery production Damage to fish habitat Loss of young fish due to decreased flows ○ Loss of national economic growth, retardation of economic development ○ Income loss for farmers and others directly affected ○ Loss of farmers through bankruptcy ○ Loss to recreational and tourism industry ○ Loss to manufacturers and sellers of recreational equipment ○ Increased energy demand and reduced supply because of drought-related power curtailments ○ Costs to energy industry and consumers associated with substituting more expensive fuels (oil) for Hydroelectric power ○ Loss to industries directly dependent on agricultural production (e.g., machinery and ○ Decline in food production/disrupted food supply Increase in food prices Increased importation of food (higher costs) ○ Disruption of water supplies ○ Unemployment from drought-related production declines ○ Strain on financial institutions (foreclosures, greater credit risk s, capital shortfalls, etc.) ○ Revenue losses to federal, state, and local governments (from reduced tax base) ○ Deterred capital investment, expansion ○ Dislocation of businesses ○ Revenues to water supply firms ○ Loss from impaired navigability of streams, rivers, and canals ○ Cost of water transport or transfer ○ Cost of new or supplemental water resource development
Environmental	○ Damage to animal species Reduction and degradation of fish and wildlife habitat Lack of feed and drinking water Disease Increased vulnerability to predation (e.g., from species concentration n ear water) ○ Loss of biodiversity

	○ Wind and water erosion of soils ○ Reservoir and lake drawdown ○ Damage to plant species ○ Water quality effects (e.g., salt concentration, increased water temperatures, pH, dissolved oxygen) ○ Air quality effects (dust, pollutants) ○ Visual landscape quality (dust, vegetative cover, etc.) ○ Increased fire hazard ○ Estuarine impacts; changes in salinity levels, reduced flushing
Social	○ Increased groundwater depletion (mining), land subsidence ○ Loss of wetlands ○ Loss of cultural sites ○ Insect infestation ○ Food shortages (decreased nutritional level, malnutrition, famine) ○ Loss of human life (e.g., food shortages, heat) ○ Public safety from forest and range fires ○ Conflicts between water users, public policy conflicts ○ Increased anxiety ○ Loss of aesthetic values ○ Health-related low flow problems (e.g., diminished sewage flows, increased pollutant concentrations, etc.) ○ Recognition of institutional constraints on water use ○ Inequity in the distribution of drought impacts/relief ○ Decreased quality of life in rural areas ○ Increased poverty ○ reduced quality of life, changes in lifestyle ○ social unrest, civil strife ○ population migration (rural to urban areas) ○ reevaluation of social values ○ increased data/information needs, coordination of dissemination activities ○ loss of confidence in government officials ○ recreational impacts

FUTURE DEVELOPMENT AND VULNERABILITY

According to the Climate Prediction Center at the NWS, drought in the near future is going to persist or intensify in the Central and West of Nebraska but for the East of Nebraska where the planning area is located drought conditions are not expected to persist in the next three months (figure 36). Besides climate variability that results in drought conditions, communities can be vulnerable and increase their drought risks with unwise land use decisions, urban development, and population growth etc.

Figure 36: U.S. Seasonal Drought Outlook



Source: *NOAA, NWS*

Communities will always have some level of vulnerability related to the phenomenon of drought. There are actions that can be taken to reduce this vulnerability in future development areas as well as potentially retrofitting existing developments and structures. Land-use regulations should consider the water supply and quality when considering areas to be developed in the future and ensure that future developments will not stress the existing water supply system or ultimately result in insufficient water supplies for the community. Communities can audit water systems as well to reduce water waste and loss through leaks and small breaks to the distribution system. It is estimated that communities lose between 10 – 20%of available water to inefficiencies in the distribution system. Building codes can also be changed to either reduce landscaped and irrigated areas or to require high efficiency irrigation systems as well as encouraging the use of low-flow fixtures in new construction areas. Xeriscaping can also be used to reduce water consumption and increase the resiliency of communities within the planning area.

Risk Assessment Summary

Overall, the risk and vulnerability assessment shows that drought has approximately a 10% chance of occurring every year. Drought does not cause significant property damage, but can impact individuals and agricultural interests adversely. Due to the way NCDC reports on drought events it is difficult to quantify the impacts. For that reason we used the Drought Impact Reporter and RMA to examine the annual damages from drought.

Mitigation Alternatives

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of drought. Many of these strategies are identified and discussed in greater detail in the FEMA document Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. Addition information regarding drought mitigation and drought planning can be found in the NDMC's Drought-Ready Communities: A Guide to Community Drought Preparedness.

Once the full extent of the damages of the Drought of 2012 is known, this information should be incorporated into the update to this plan in 5 years.

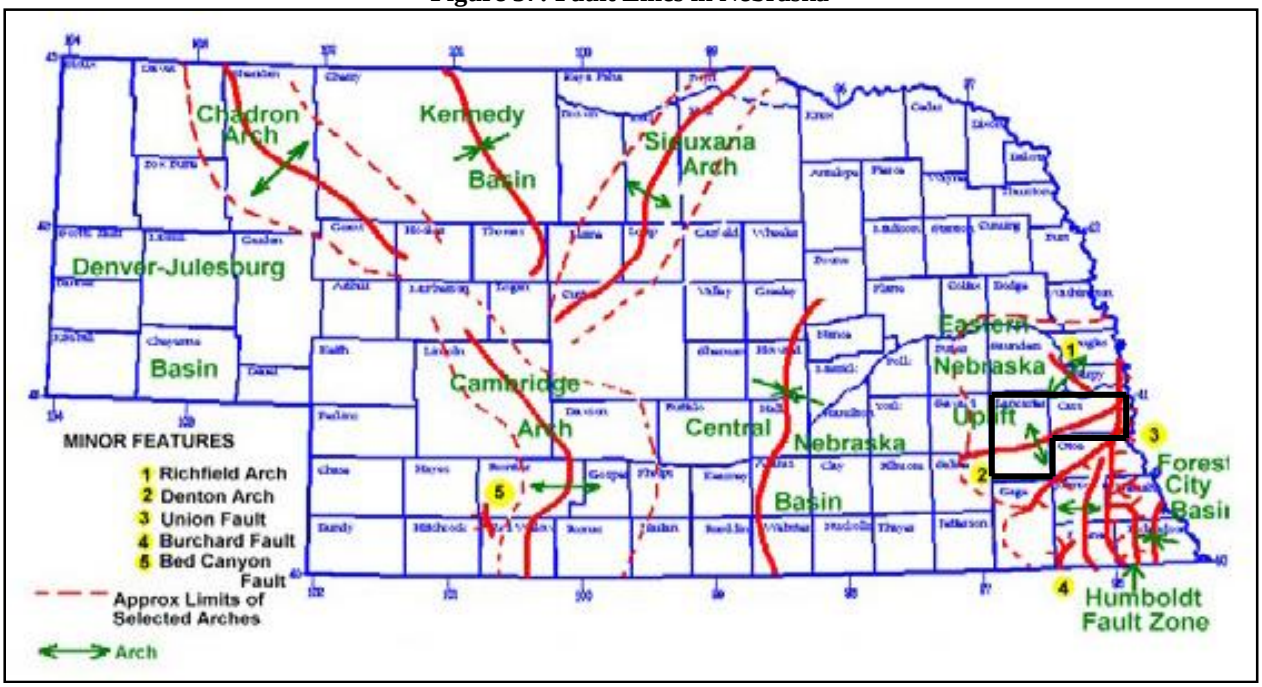
- Assess Drought Vulnerability (identify factors that affect drought severity for local jurisdictions)
- Establish a Drought Monitoring Board and drought reporting procedures
    - Lincoln/Lancaster County has a drought board
- Establish monitoring procedures for municipal water supply and distribution systems
    - Rural water districts monitor water supplies; LPSNRD is active in protecting ground and surface water resources
- Develop drought specific plans (this may include water conservation plans, drought preparedness plans, and wellhead protection plans)
    - This has not occurred
- Establish municipal water conservation programs
    - Many participating communities reported water conservation as an ongoing strategy
- Establish agricultural policies (agricultural irrigation standards, grazing policies, etc.)
    - Wellhead protection districts is under the purview of the LPSNRD
- Enhanced residential landscape standards (xeriscaping, irrigation systems requirements, etc.)
    - This has not occurred
- Enhanced building codes to require low-flow fixtures in new construction
    - This has not occurred
- Incentives to retrofit structures with low-flow fixtures
    - This has not occurred
- Incorporate permeable surfaces into municipal designs
    - Some communities utilize low-impact development practices and have identified that as either a new or ongoing mitigation strategy
- Investigate alternative water supply options
    - This is community specific; some communities have identified this as a mitigation strategy
- Participate in the Tree City USA program
    - Refer to participant sections
- Encourage agricultural businesses to purchase crop insurance as appropriate
    - Ongoing
- Drought education programs (residential and agricultural)
    - County EMAs have education programs related to regional hazards

Earthquakes

HAZARD PROFILE

An earthquake is the result of a sudden release of energy in the Earth's tectonic plates that creates seismic waves. The seismic activity of an area refers to the frequency, type, and size of earthquakes experienced over a period of time. Although rather uncommon, earthquakes do occur in Nebraska, and are usually small, generally not felt, and cause little to no damage. Figure 37 shows the fault lines in Nebraska.

Figure 37: Fault Lines in Nebraska



Source: NDNR

EXTENT

Earthquakes are measured by magnitude and intensity. Magnitude is measured by the Richter Scale, a base-10 logarithmic scale, which uses seismographs around the world to measure the amount of energy released by an earthquake. Intensity is measured by the Modified Mercalli Intensity Scale, which determines the intensity of an earthquake by comparing actual damage against damage patterns of earthquakes with known intensities. Tables 39 and 40 summarize the Richter Scale and Modified Mercalli Scale. If an earthquake did occur it would not be stronger than a 3 or 4 on the Richter Scale.

Table 39: Richter Scale

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5 – 5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 – 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: FEMA

Table 40: Modified Mercalli Intensity Scale

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	< 4.2
III	Slight	Felt by people resting, like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	< 5.4
VII	Very Strong	Mild Alarm; walls crack; plaster falls	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	> 8.1

Source: FEMA

Historical Occurrences

Figure 38 displays historical occurrences of earthquakes in and around the planning area and State of Nebraska. The information displayed is from the NEIC Earthquake Search database provided by the USGS Earthquake Hazards Program. Based on this information there have been no recorded earthquakes in the planning area dating back to 1975.

Figure 38: Nebraska Earthquakes

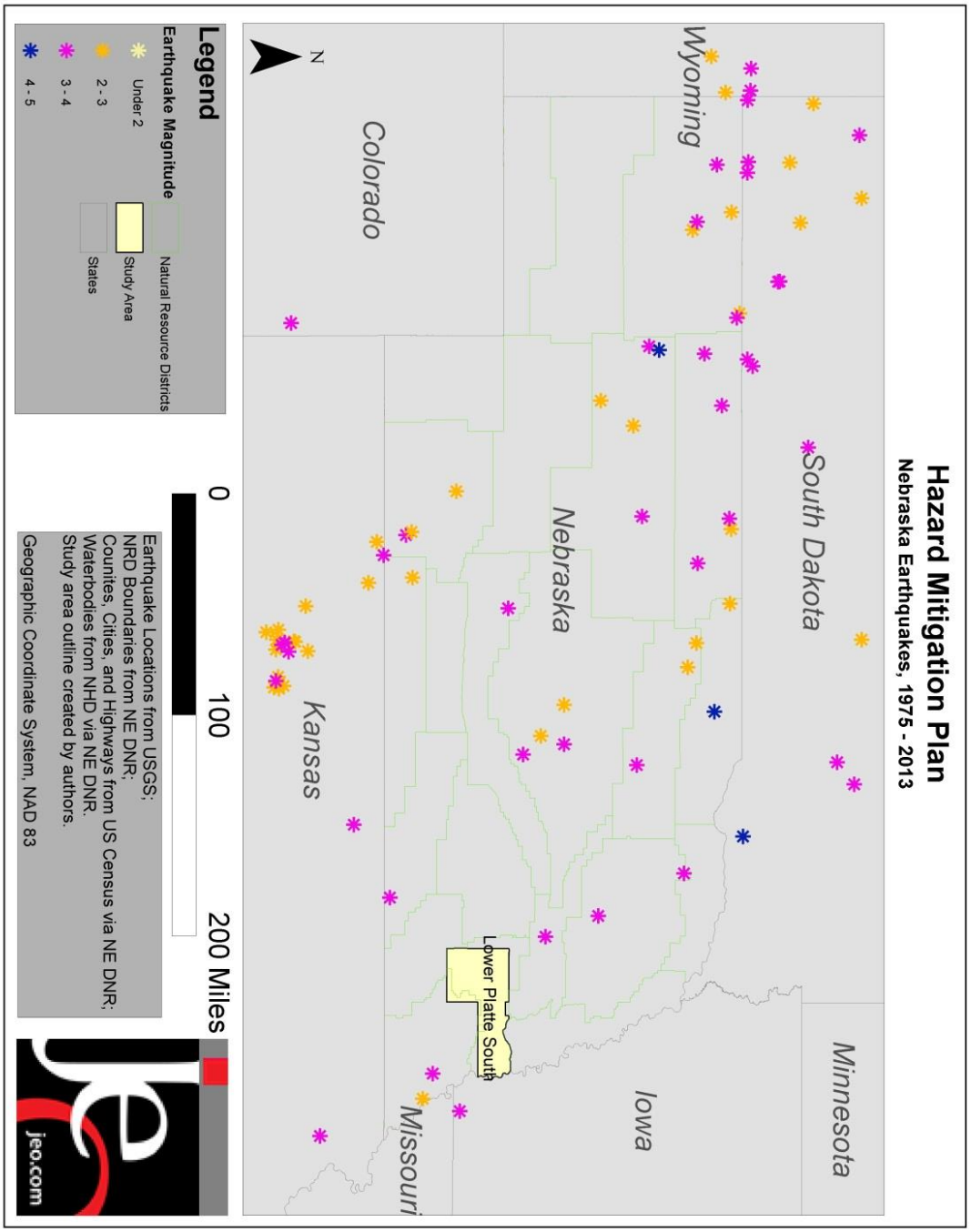


Figure 39: Nebraska Earthquakes

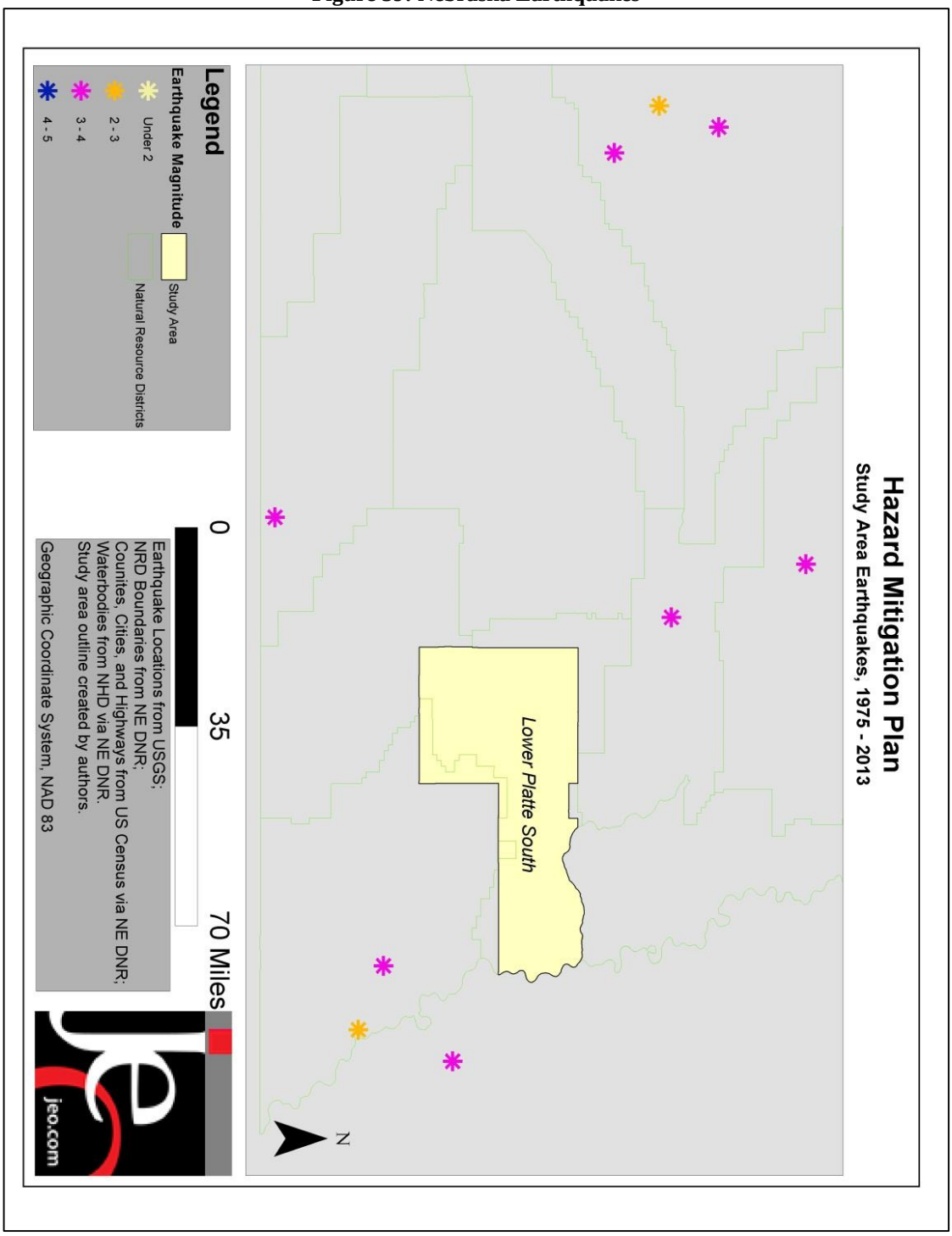
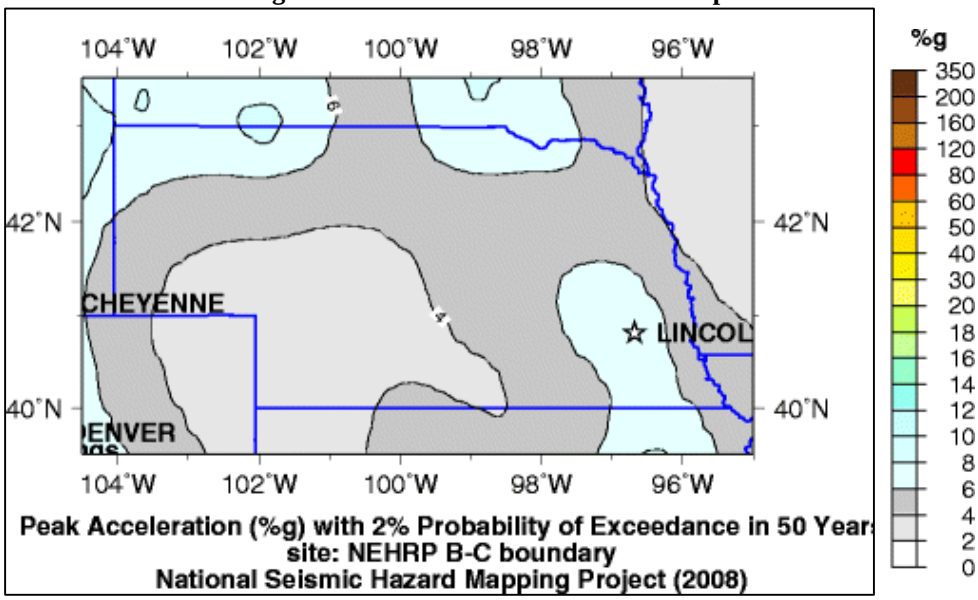


Figure 40: Nebraska Seismic Hazard Map



Source: USGS

Average Annual Damages and Frequency

Due to the lack of sufficient earthquake data, limited resources, extremely low earthquake risk for the area, and limited reports of historical occurrences with recorded damages, it is not feasible to utilize the 'event damage estimate formula' to estimate potential losses for the planning area. There has not been an earthquake recorded in the planning area.

Vulnerability Assessment

Low income individuals are particularly vulnerable to the threat of earthquake. Often, low income individuals and families live in lower cost homes (older homes, mobile homes) that are less able to withstand disaster. Older homes and mobile homes may not have been constructed using the most advanced building codes or have received updates and retrofits that would have increased their stability and ability to withstand seismic events. Damages resulting from the 1994 Northridge earthquake in California were disproportionately focused on low and moderate income rental housing units that were older and thus more vulnerable to seismic damages.

Future Development and Vulnerability

Earthquakes are not a significant concern for the planning area. All structures are vulnerable to earthquakes. Building codes can be enhanced to require great consideration for seismic events. Education programs can be implemented, informing homeowners and residents about anchoring or appliances.

Risk Assessment Summary

Earthquakes have approximately a 1% chance of occurring in a given year. These events are likely to be limited in extent to 4 or less on the Richter Scale. It is possible that critical facilities and services could be interrupted but it is not likely.

Mitigation Alternatives

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of earthquakes. Some of these strategies, such as the use of warning systems, are already in place in the planning area. Many of these strategies are identified and discussed in greater detail in the FEMA document *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*.

- Adopt and enforce seismic building codes
    - Communities with building codes have adopted a version of the International Building Codes which includes some seismic requirements, but due to the low threat for the planning area this is not a great concern for most communities
- Incorporate Seismic Safety into all Local Plans (i.e., create a Seismic Safety Committee)
    - This is not standard in the planning area
- Conduct Inspections of Building Safety (i.e., identify seismic risk)
    - Building inspections take place in many communities but they do not focus on seismic threats
- Protect CFs and Infrastructure (i.e., installing shut off valves; bracing equipment; and reviewing all bridge construction plans)
    - CFs are constructed in accordance with local building codes
- Implement Structural Mitigation Techniques (i.e. membranes on windows to prevent glass shattering, steel bracing on chimneys; etc.)
    - This is not standard in the planning area
- Increase Earthquake Risk Awareness (i.e. outreach to businesses, schools, and individuals)
    - County EMAs offer materials related to regional hazards
- Conduct outreach to building inspectors, engineers and architects.

Grass/Wildfires

HAZARD PROFILE

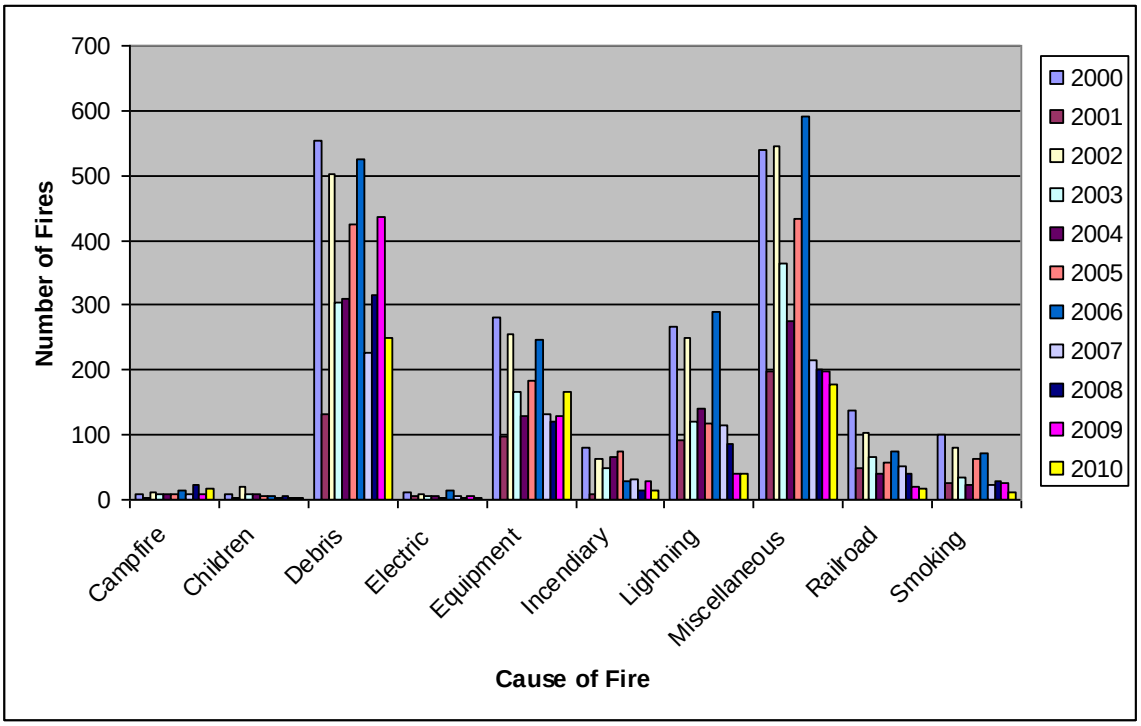
Wildfires, also known as brushfires, forest fires, or wildland fires, are any uncontrolled fire that occurs in the countryside or wildland. Wildland areas may include, but are not limited to, grasslands, forests, woodlands, agricultural fields, and other vegetated areas. Wildfires differs from other fires by their extensive size, the speed at which they can spread out from the original source, their ability to change direction unexpectedly, and to jump gaps, such as roads, rivers, and fire breaks. While some wildfires burn in remote forested regions, others can cause extensive destruction of homes and other property located in the wildland-urban interface, the zone of transition between developed areas and undeveloped wilderness.

Wildfires are a growing hazard in most regions of the United States, posing a threat to life and property, particularly where native ecosystems meet urban developed areas. Although fire is a natural and often beneficial process, fire suppression can lead to more severe fires due to the buildup of vegetation, which creates more fuel and increases the intensity and devastation of future fires.

Lightning starts approximately 10,000 ***forest fires*** *each year, yet four out of every five forest fires are started by humans.*

Wildfires are characterized in terms of their physical properties including topography, weather, and fuels. Wildfire behavior is often complex and variably dependent on factors such as fuel type, moisture content in the fuel, humidity, wind speed, topography, geographic location, ambient temperature, the effect of weather on the fire, and the cause of ignition. Fuel is the only physical property humans can control and is the target of most mitigation efforts. The NWS monitors the risk factors including high temperature, high wind speed, fuel moisture (greenness of vegetation), low humidity, small cloud cover in the state on a daily basis.

Figure 41: Number of Wildfires by Cause in Nebraska 2004-2010



Source: Nebraska Forest Service

In recent decades, as the population of the United States has decentralized and residents have moved farther away from the center of villages and cities, the area known as the wildland urban interface (WUI) has developed significantly, in both terms of population and building stock. The WUI is defined as the zone of transition

between developed areas and undeveloped wilderness, where structures and other human development meet wildland. The expansion of the WUI increases the likelihood that wildfires will threaten people and homes, making it the focus of the majority of wildfire mitigation efforts.

Historical Occurrences

The state of Nebraska, especially the western portion, is vulnerable to wildfires. For the planning area there were 931 reported wildfires by 23 different fire departments according to the Nebraska Forestry Service from 2000 to 2012. The reported events burned 6,804 acres of range land, 180 acres of forest land, and 850 acres of crop land. The reported fire events caused $39,535 in crop damages and $469,534 in structural damages.

Figure 42: Fires by Cause in LPSNRD (2000-2012)

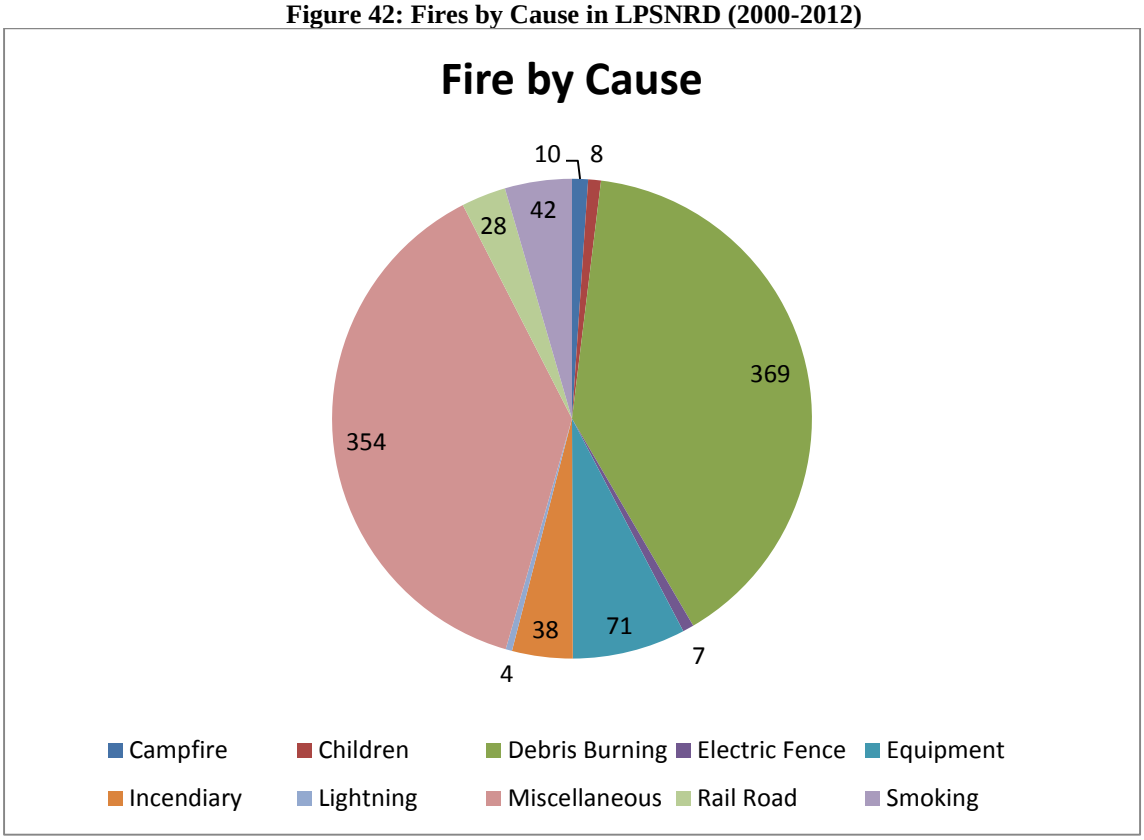


Figure 43: Fires per Year in LPSNRD

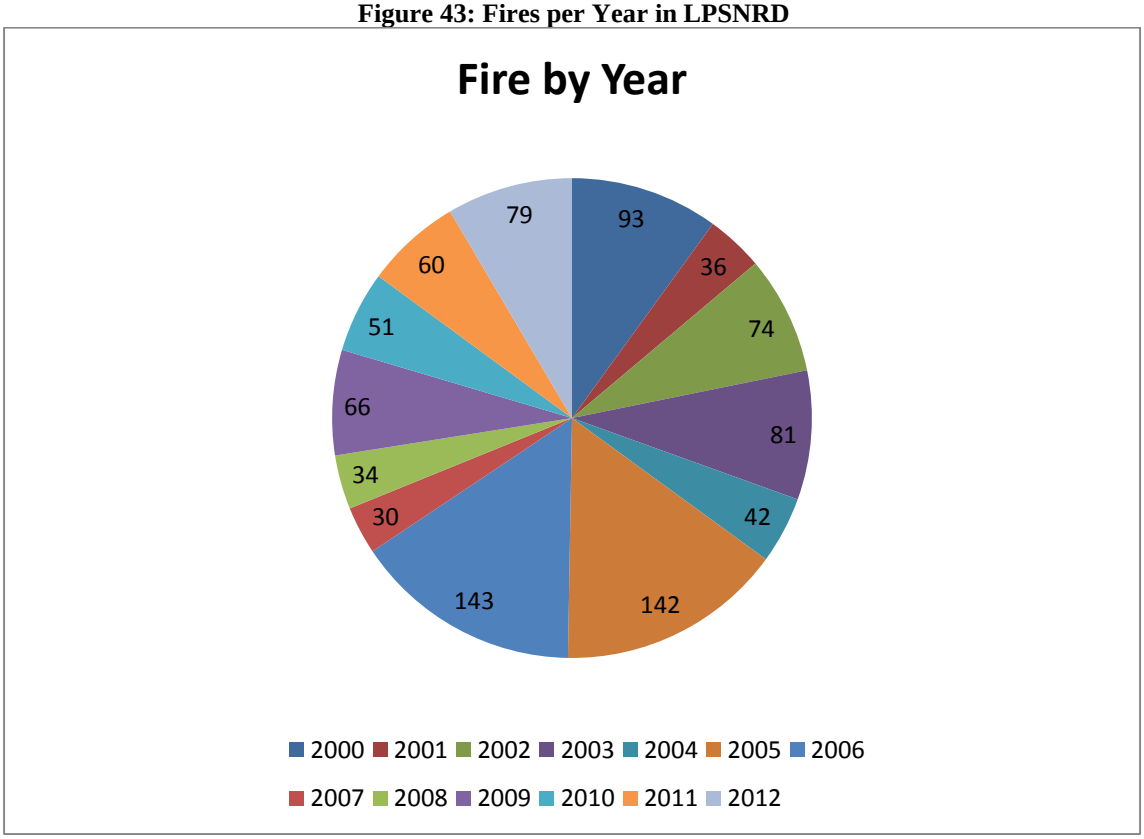


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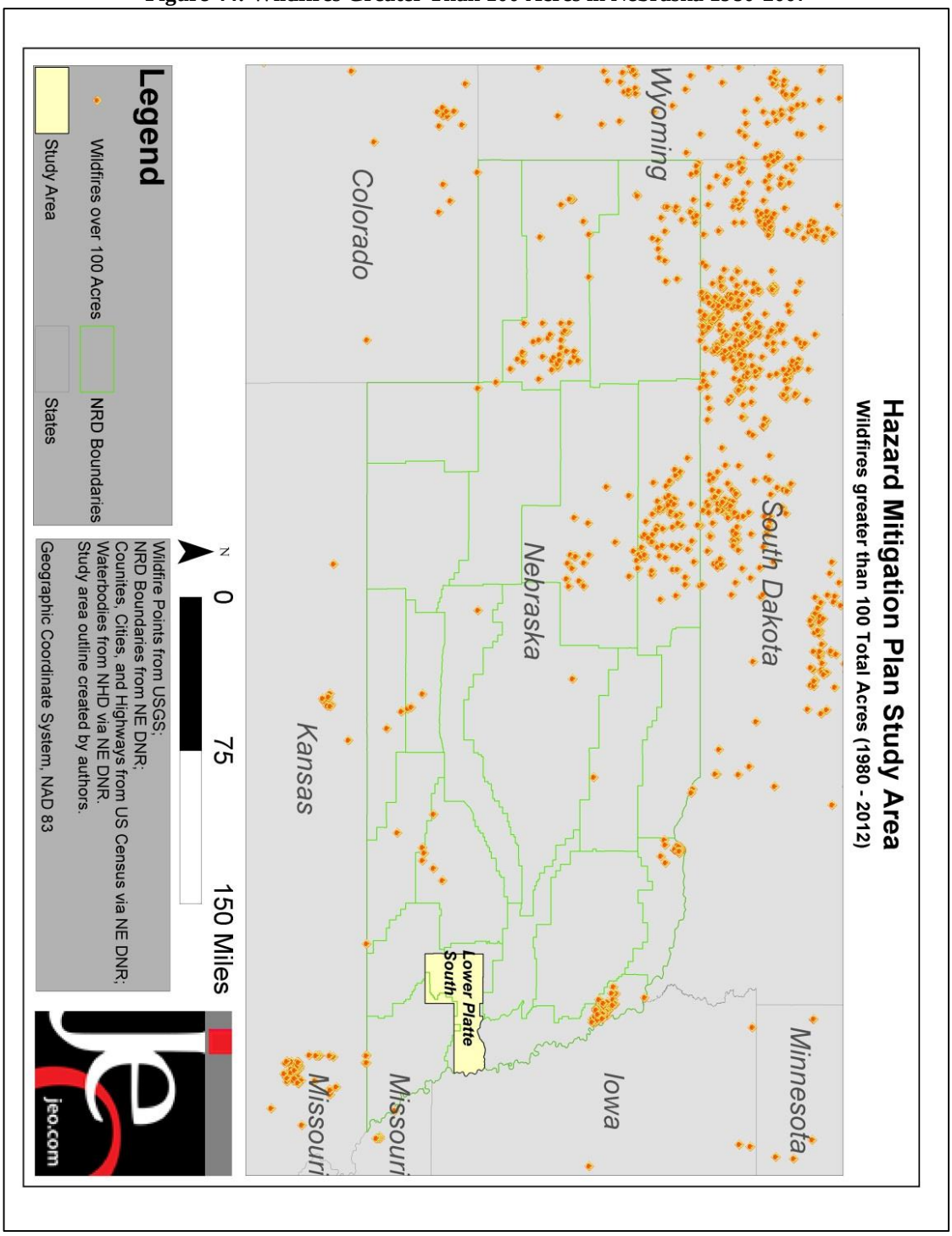
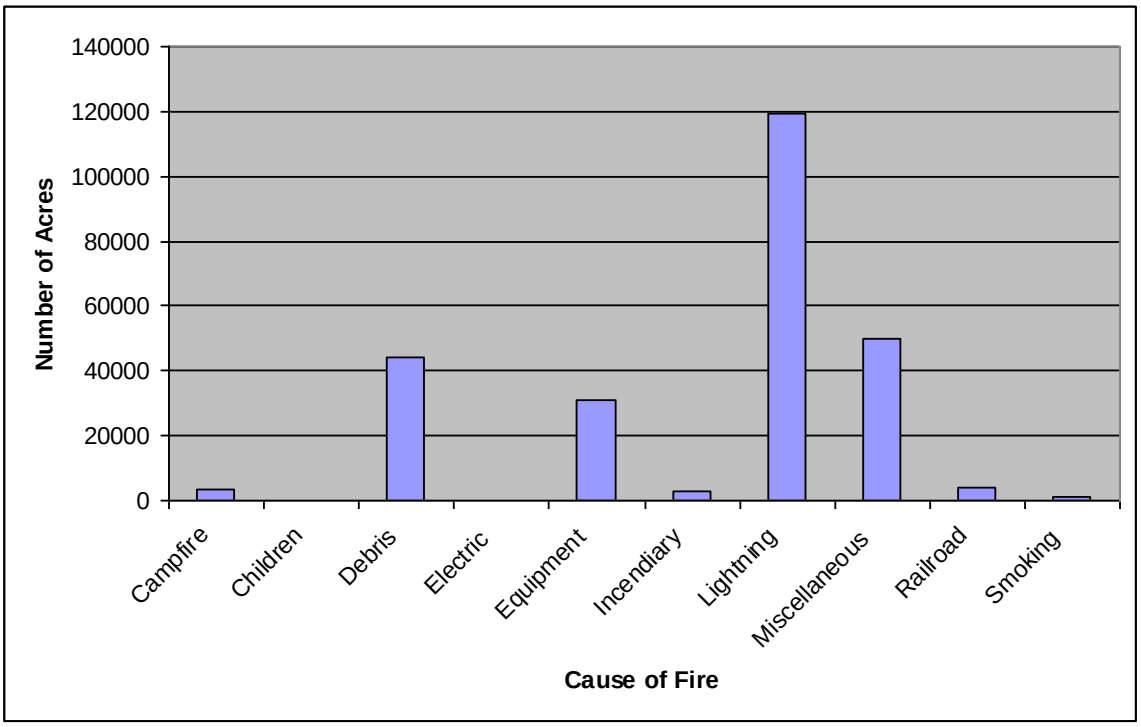
Figure 44: Wildfires Greater Than 100 Acres in Nebraska 1980-2007



EXTENT

Based on the Nebraska Forest Service's 'Wildfire by Cause' report, the most common causes of wildfires include lightning, debris burning, equipment use, and arson. Based on historical occurrences, wildfires in the planning area are likely to burn an average of 8.4 acres. Figure 45 illustrates the number of wildfires and acres burned by cause in Nebraska from 2004 to 2010.

Figure 45: Acres Burned by Cause in Nebraska 2004-2010



Source: Nebraska Forest Service

AVERAGE ANNUAL DAMAGES AND FREQUENCY

Due to the limited reports of historical occurrences with recorded damages, it is not feasible to utilize the 'damage estimate formula' to estimate potential losses for the planning area. There were 931 wildfires in the planning area from 2000-2012.

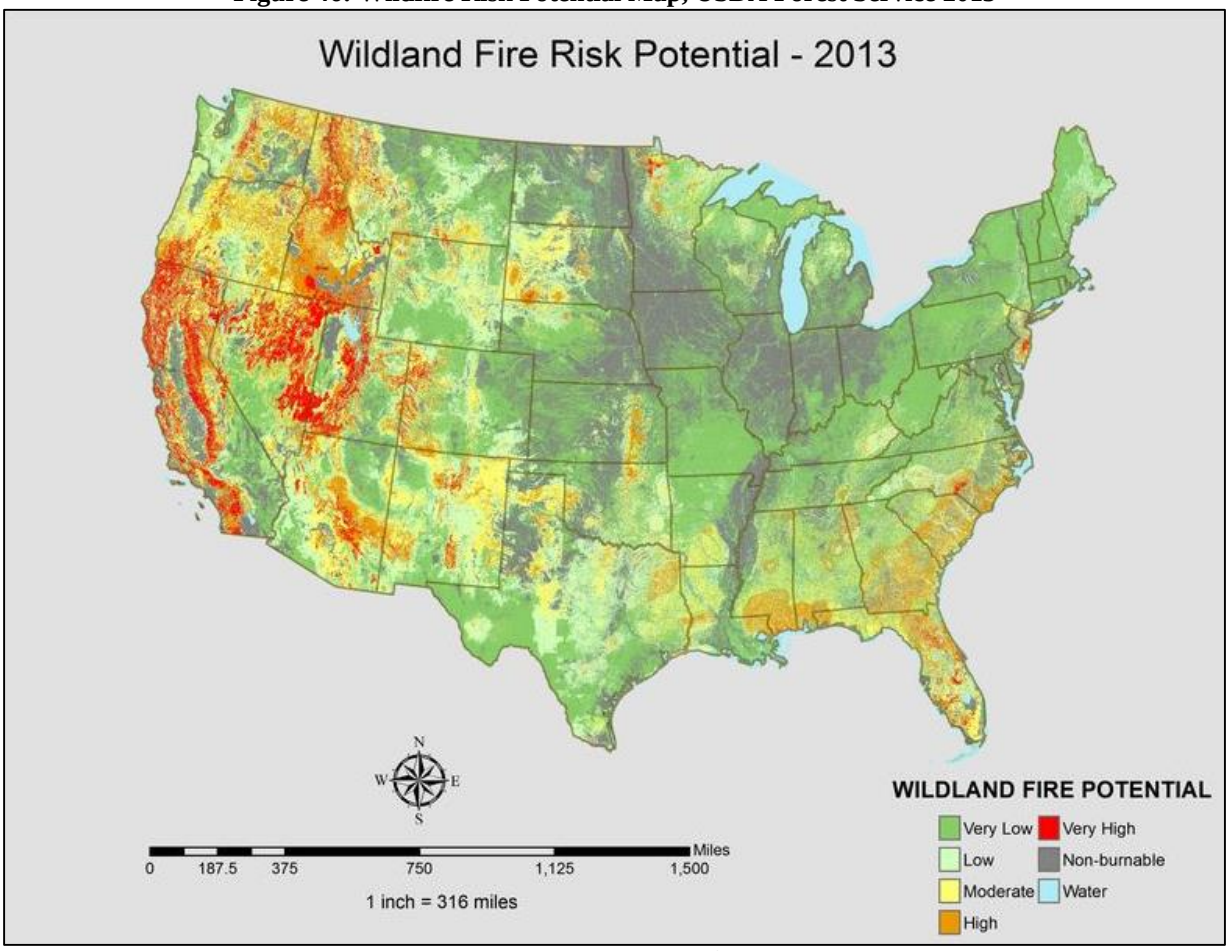
VULNERABILITY ASSESSMENT

According to FEMA, periods of drought and dry conditions throughout the year greatly increase the potential for wildland fires and contribute to extreme wildfires. During a severe drought, large wildfires are common with windy days and steep slopes, which can cause wildfires to spread rapidly and become out of control in a very short time period.

Wildfires can cause extensive damage, both to property and human life. The damages caused by wildfires extend past the loss of building stock, recreation areas, timber, forage, wildlife habitat, and scenic views. In addition, the secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, all increase due to the exposure of bare ground and loss of vegetative cover following a wildfire, are often more disastrous than the fire itself.

Wildfire poses a threat to a range of demographic groups. Wildfire and urban wildfire could result in major evacuations of residents in impacted and threatened areas. Groups and individuals lacking reliable transportation could be trapped in dangerous locations. Lack of transportation is common among the elderly, low income individuals, and families especially in urban areas. Homes and residents located in the Wildland/Urban Interface are also very vulnerable to wildfire and urban fires. The shift of homes and businesses into or near Wildland areas has resulted in an increase in structural fire losses related to wildfires.

Figure 46: Wildfire Risk Potential Map, USDA Forest Service 2013



Source: United State Department of Agriculture

Wildfires vary greatly depending on the location and severity of the event. Wildfires can cause extensive damage to both urban and rural building stock and properties including CFs and infrastructure, as well as crop and rangeland which support the local industry and economy. Wildfires can pose a significant threat to human life. Recreation areas, timber and forage land, wildlife habitat, and scenic views can also be threatened by wildfires.

The secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, all increase due to the exposure of bare ground and loss of vegetative cover following a wildfire. By directing the location of structures in relation to topography and fuels present as well as construction methods and materials, jurisdictions can guide growth and development to mitigate potential losses from wildfires.

FUTURE DEVELOPMENT AND VULNERABILITY

Areas for future development in the WUI will be vulnerable to the impacts of wildfire. Structures constructed in the WUI should incorporate a defensible area.

RISK ASSESSMENT SUMMARY

Wildfires will likely occur annually within the planning area. There have been no wildfires greater than 100 acres within the planning area. Based on historical occurrences, these events are likely to be limited to 8.4 acres.

MITIGATION ALTERNATIVES

The following bullet points identify some general mitigation strategies that can be used to reduce a community's vulnerability to the threat of wildfire. Some of these strategies, such as the use of warning systems, are already in place in the planning area. Many of these strategies are identified and discussed in greater detail in the *FEMA document Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.*

- Map and Assess Vulnerability to Wildfire
    - This has not occurred in the planning area
- Incorporate Wildfire Mitigation in Comprehensive Planning (i.e., identify areas of risk per assessment of vulnerability)
    - This is not standard in the planning area
- Reduce Risk Through Land Use Planning (i.e., implement landscaping ordinances)
    - This is not standard in the planning area
- Develop a Wildland-Urban interface Code
    - This is not standard in the planning area
- Require or Encourage Fire-Resistant Construction (i.e., encourage the use of non-combustible materials)
    - This is not standard in the planning area
- Retrofit At-Risk Structures with Ignition-Resistant Materials (i.e., installing wall components that conform to ignition-resistant construction standards)
    - IBC codes address combustibility of building materials
- Create Defensible Space Around Structures and Infrastructure
    - This is not standard in the planning area
- Conduct Maintenance to Reduce Risk (i.e., perform arson prevention cleanup activities)
    - Members of Tree City USA have tree care ordinances that help reduce fuel loads
- Implement a Fuels Management Program (i.e., Nebraska Forest Service – Forest Fuels Reduction Program)
- Participate in Firewise Program
    - No communities are presently participating
- Increase Wildfire Risk Awareness (i.e., informing the public about proper evacuation procedures)
- Educate Property Owners about Wildfire Mitigation Techniques
- Wildland Fire Fighting Training for Fire Departments

Levee Failure

HAZARD PROFILE

According to FEMA's website:

> "The United States has thousands of miles of levee systems. These manmade structures are most commonly earthen embankments designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems date back as far as 150 years. Some levee systems were built for agricultural purposes. Those levee systems designed to protect urban areas have typically been built to higher standards. Levee systems are designed to provide a specific level of flood protection. No levee system provides full protection from all flooding events to the people and structures located behind it. Thus, some level of flood risk exists in these levee-impacted areas."

Levee failure can occur several ways. A breach of a levee is when part of the levee breaks away, leaving a large opening for floodwaters to flow through. A levee breach can be gradual by surface or subsurface erosion, or it can be sudden. A sudden breach of a levee often occurs when there are soil pores in the levee that allow water to flow through causing an upward pressure greater than the downward pressure from the weight of the soil of the levee. This under seepage can then resurface on the backside of the levee and quickly erode a hole to cause a breach. Sometimes the levee actually sinks into a liquefied subsurface below.

Another way a levee failure can often occur is when the water overtops the crest of the levee. This happens when the flood waters simply exceed the lowest crest elevation of the levee. An overtopping can lead to significant erosion of the backside of the levee and result in a breach and thus a levee failure.

EXTENT

The Army Corps of Engineers who is responsible for levee oversight and inspection of Levees has 5 classifications for levee safety.

Table 41: Levee Safety Action Classification

Class	Urgency
I	Urgent and Compelling
II	Urgent
III	High Priority
IV	Priority
V	Normal

Based on historic records it is not likely to have a levee failure in the planning area. If a levee failure were to occur the most likely failure would be from a class I or II levee.

HISTORICAL OCCURRENCES

The only occurrence of a levee failure in the planning area was reported by Cass County SID #1 (Lake WaConDa). They recorded that 'in the spring of 2003, the river was one inch from cresting. The community used 7 dewatering pumps to keep the water down. Six homes were damaged and there was a broken levee.'

AVERAGE ANNUAL DAMAGES AND FREQUENCY

Due to the lack of sufficient data, limited resources, nature of damages, and limited reports of historical occurrences with recorded damages, it is not feasible to utilize the 'event damage estimate formula' to estimate potential losses for the planning area. The formula cannot be used, but damage can be estimated based on the known inundation area for the levee. The levee within the city of Lincoln does not provide any protection from the 1% annual floodplain. Due to this data limitation on what structures these levee failures would affect, these structures were not assessed.

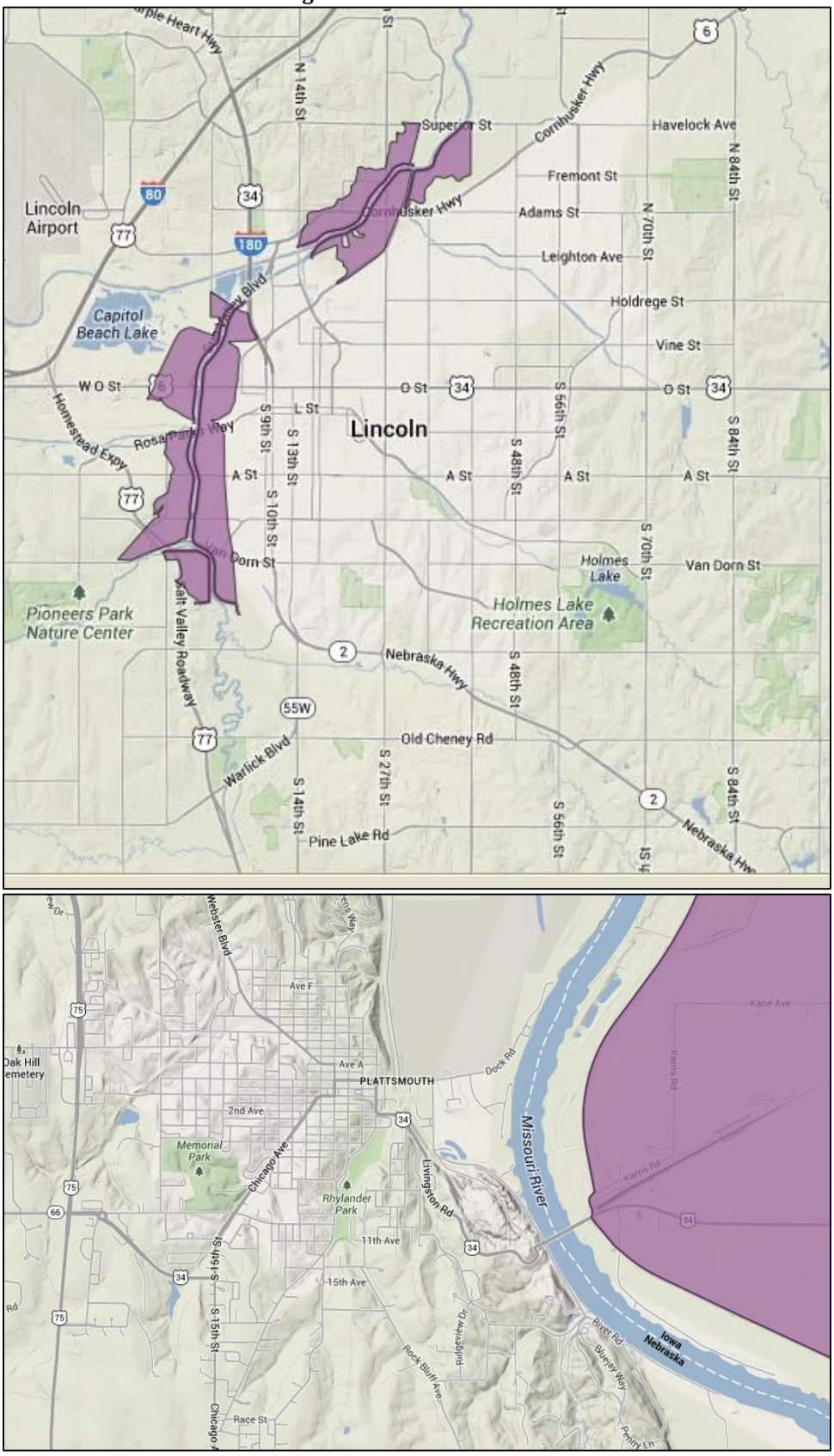
Within Cass County SID #1 there are 151 residential structures with the inundation area. Utilizing the median home value for Cass County an estimate of assets at risk relative to the residential structures can be established. The median home value in Cass County as reported by the Nebraska Department of revenue for 2013 was $238,494 for the 151 residential structures in the inundation area and estimated value of $36,055,390 can be assumed. The estimated $36 million assumes the total loss of the structures.

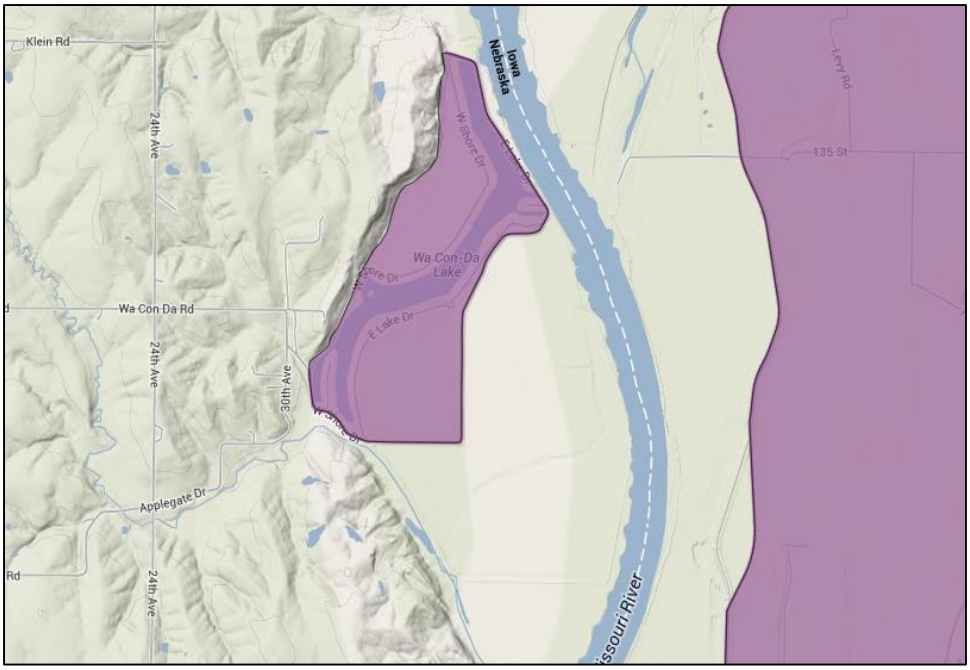
VULNERABILITY ASSESSMENT

It was deemed, by both the public and factual research that the planning area as a whole has one previous occurrence of levee failure. This event was in Cass County SID #1 (Lake WaConDa) and was reported by the community. The chance of a levee failure is less than 10% per year. Impacts to people and property were also determined to be low since a limited number of communities have or are near levees. Specifically, Cass County SID 1 (Lake WaConDa), the City of Lincoln, and Cedar Creek have some vulnerability related to levee failure. The damages of a levee failure will be limited to those areas behind the levee.

In the event that a levee failure occurred, effects would be similar to those of a flood. The effects, damages, and locations of flooding are covered under the "Flooding" sections. Damages which may be caused by flooding include loss of structures, destruction of infrastructure such as bridges and roads, loss of utilities and potential for loss of life. For more specific information regarding levee failure events in the jurisdictions within the Planning Area, refer to each jurisdiction's respective participant section. Levee failure only affects those jurisdictions that have levees. The jurisdictions that have levees are: Plattsmouth, Cass County, Cass County SID #1 (Lake WaConDa), Lancaster County and the City of Lincoln.

Figure 47: LPSNRD Levees





Source: National Levee Database

FUTURE DEVELOPMENT AND VULNERABILITY

Land-use regulations should prohibit development within floodplains and areas currently protected by existing levees and dams. Levee failure should not be a significant threat to future development and losses should be insignificant. Communities should encourage structures currently protected by levees to purchase flood insurance from the NFIP whether they are technically located in the floodplain or not.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that the potential impacts of a levee failure are low for the planning area. Although the levee failure scenario does illustrate a significant amount of property damage, it does not take into account the elevation of the structures in the 0.2% floodplain.

MITIGATION ALTERNATIVES

Land-use regulations should prohibit development within floodplains and areas currently protected by existing levees and dams. Levee failure should not be a significant threat to future development and losses should be insignificant. Communities should encourage structures currently protected by levees to purchase flood insurance from the NFIP whether they are technically located in the floodplain or not.

Hazard mitigation options for levee failure include most of the wide-range of actions described previously for flooding, as well as additional actions related to warning and evacuation

Dam Failure

HAZARD PROFILE

According to the Nebraska Administrative Code, Title 458, Chapter 1, Part 001.09, dams are " any artificial barrier, including appurtenant works, with the ability to impound water, wastewater, or liquid-borne materials and which is:

- is twenty-five feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier, or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse, to the maximum storage elevation or
- has an impounding capacity at maximum storage elevation of fifty acre- feet or more, except that any barrier described in this subsection which is not in excess of six feet in height or which has an impounding capacity at maximum storage elevation of not greater than fifteen acre-feet shall be exempt, unless such barrier, due to its location or other physical characteristics, is classified as a high hazard potential dam. Dam does not include:
    - an obstruction in a canal used to raise or lower water;
    - a fill or structure for highway or railroad use, but if such structure serves, either primarily or secondarily, additional purposes commonly associated with dams it shall be subject to review by the department;
    - canals, including the diversion structure, and levees; or
    - water storage or evaporation ponds regulated by the United States Nuclear Regulatory Commission."

The Department of Natural Resources uses a classification system for dams throughout the State including those areas participating this this plan. The classification system includes three classes such as Small, Intermediate, and Large, which are defined as:

Size	Effective Height (feet) x Effective Storage (acre-feet)	Effective Height
Small	≤ 3,000 acre-feet2	and ≤ 35 feet
Intermediate	> 3,000 acre-feet2 to < 30,000 acre-feet2	or > 35 feet
Large	≥ 30,000 acre-feet2	Regardless of Height

The effective height of a dam is defined as the difference in elevation in feet between the natural bed of the stream or watercourse measured at the downstream toe (or from the lowest elevation of the outside limit of the barrier if it is not across stream) to the auxiliary spillway crest. The effective storage is defined as the total storage volume in acre-feet in the reservoir below the elevation of the crest of the auxiliary spillway. If the dam does not have an auxiliary spillway, the effective height and effective storage should be measured at the top of dam elevation.

Dam failure, as a hazard, is described as a structural failure of a water impounding structure. Structural failure can occur during extreme conditions, which include but are not limited to:

- Reservoir inflows in excess of design flows
- Flood pools higher than previously attained
- Unexpected drop in pool level
- Pool near maximum level and rising
- Excessive rainfall or snowmelt
- Large discharge through spillway

- Erosion, landslide, seepage, settlement, and cracks in the dam or area
- Earthquakes

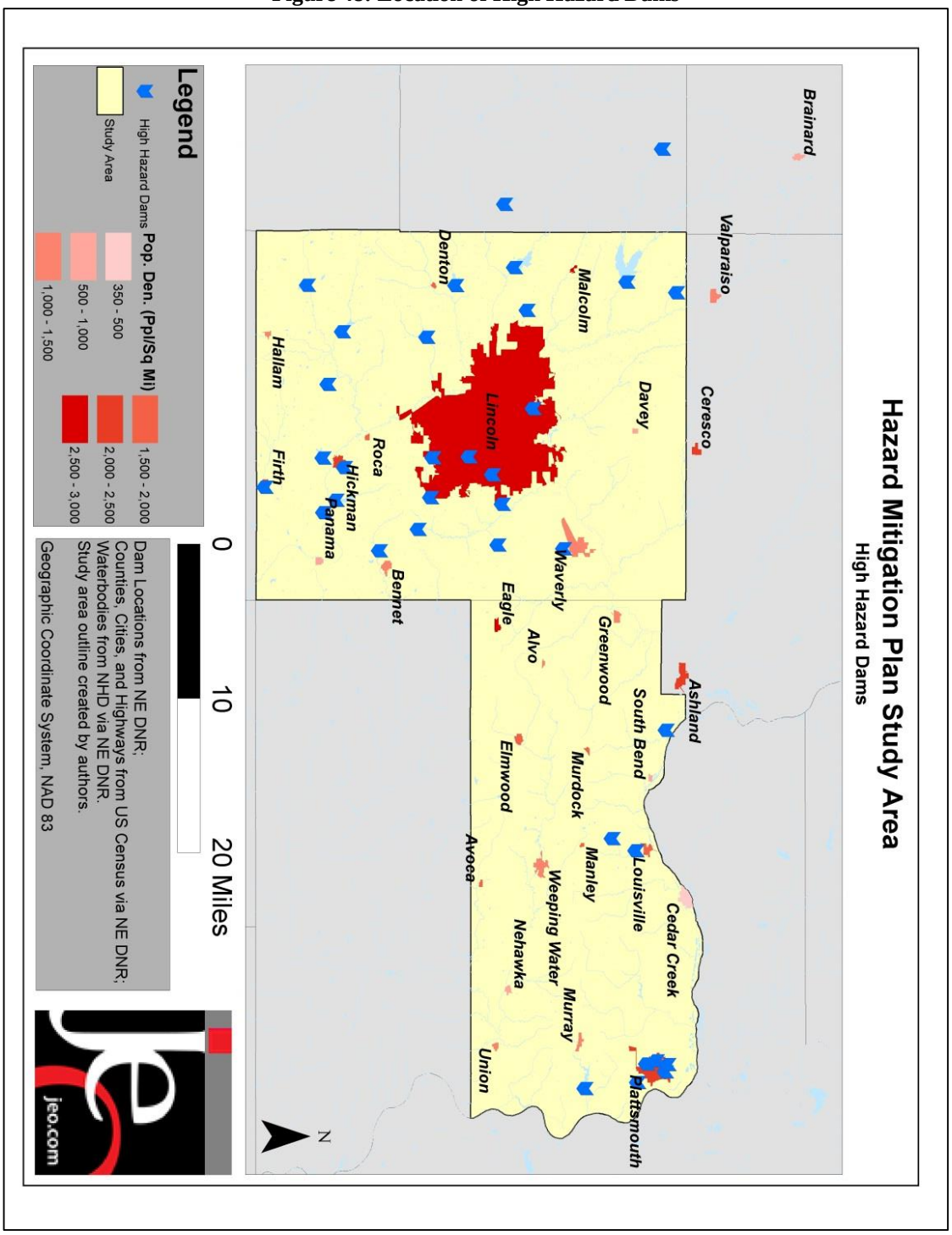
According to the DNR there are ten dams owned by LPSNRD, ten additional dams owned by the U.S. Army Corps of Engineers, along with an unconfirmed number of privately owned dams within the region. The high hazard dams are listed in Table 42 and depicted in Figure 48.

Table 42: Dams Summary for the LPSNRD

County	Total Number of Dams	Classification - Downstream Hazard Potential		
		High	Significant	Low
Cass	**67**	**8**	**23**	**35**
Lancaster	**147**	**25**	**17**	**105**
HMP Planning area	**214**	**34**	**40**	**140**

Source: NDNR
**Totals may not equal 100% due to boundary issues.*

Figure 48: Location of High Hazard Dams



NDNR regulates dam safety and has classified dams by the potential hazard each poses to human life and economic loss. The following are classifications and descriptions for each hazard class:

- **Minimal Hazard Potential** - failure of the dam would likely result in no economic loss beyond the cost of the structure itself and losses principally limited to the owner's property.

- **Low Hazard Potential -** failure of the dam would result in no probable loss of human life and in low economic loss. Failure may damage storage buildings, agricultural land, and county roads.

- **Significant Hazard Potential -** failure or misoperation of the dam would result in no probable loss of human life but could result in major economic loss, environmental damage, or disruption of lifeline facilities. Failure may result in shallow flooding of homes and commercial buildings or damage to main highways, minor railroads, or important public utilities.

- **High Hazard Potential -** failure or misoperation of the dam resulting in loss of human life is probable. Failure may cause serious damage to homes, industrial or commercial buildings, four-lane highways, or major railroads. Failure may cause shallow flooding of hospitals, nursing homes, or schools.

Dams that are classified with high hazard potential require the creation of an Emergency Action Plan (EAP). The EAP defines responsibilities and provides procedures designed to identify unusual and unlikely conditions which may endanger the structural integrity of the dam within sufficient time to take mitigating actions and to notify the appropriate emergency management officials of possible, impending, or actual failure of the dam. The EAP may also be used to provide notification when flood releases will create major flooding. An emergency situation can occur at any time; however, emergencies are more likely to happen when extreme conditions are present. The EAP includes information regarding the efficiency of emergency response entities so that proper action can be taken to prevent the loss of life and property. Local emergency response entities generally included in an EAP include but are not limited to 911 Dispatch, County Sheriffs, Local Fire Departments, Emergency Management Agency Director, County Highway Department, and the NWS. Table 43 lists those dams classified as "High Hazard Potential."

Table 43: High Hazard Dams in the LPSNRD

City	Name	NIDID	Purpose	Dam Height	Maximum Storage (acre-feet)	Last Inspection Date
Plattsmouth (Cass County)	Plattsmouth 10-A	NE00097	Flood Control	40	137	6/20/2012
Plattsmouth (Cass County)	Plattsmouth 18-A	NE00098	Flood Control	25	117	6/20/2012
Plattsmouth (Cass County)	Plattsmouth 12-A	NE00099	Flood Control	32	76	6/20/2012
Rural Rock Bluff (Cass County)	Beaver Lake Dam	NE00102	Recreational	96	12,760	8/31/2012
Plattsmouth (Cass County)	Plattsmouth 4-A	NE01888	Flood Control	25	16	6/20/2012
Plattsmouth (Cass County)	Plattsmouth 7-C	NE01889	Flood Control	26	19	6/20/2012
Rural Ashland (Cass County)	Qwest (Century Link) Dam	NE02322	Recreation	44	173	4/25/2012
Rural Louisville	Mill Creek Rd Site 7	NE02399	Flood Control	41	213	4/25/2012
Rural Louisville (Cass County)	Gaebel Dam	NE03241	Flood Control	37.5	None Given	None Given
Rural Sprague (Lancaster County)	Upper Salt Creek 3-A	NE00505	Flood Control	45	1,400	11/8/2012
Rural Hickman (Lancaster County)	Upper Salt Creek 35-A	NE00523	Flood Control	32	450	3/29/2012
Rural Lincoln (Lancaster County)	Wedgewood Lake Dam	NE00527	Recreation	16	236	10/24/2012
Rural Hickman (Lancaster County)	Upper Salt Creek 10-A	NE00533	Flood Control	36	1,689	4/10/2012
Firth (Lancaster County)	Upper Big Nemaha 11-A	NE00550	Flood Control	36	1,148	3/29/2012
Rural Denton (Lancaster County)	Salt Creek Site 12-Conestoga	NE001055	Flood Control	60	15,000	5/3/2012
Rural Hickman (Lancaster County)	Salt Creek Site 8-Wagon Train	NE001056	Flood Control	52	15,050	7/18/2012

City	Name	NIDID	Purpose	Dam Height	Maximum Storage (acre-feet)	Last Inspection Date
Rural Malcolm (Lancaster County)	Salt Creek site 14-Pawnee	NE01057	Flood Control	70	38,300	10/3/2012
Rural Denton (Lancaster County)	Salt Creek Site 10-Yankee Hill	NE01058	Flood Control	54	10,300	5/3/2012
Hickman (Lancaster County)	Salt Creek Site 9-Stagecoach	NE01059	Flood Control	48	10,200	7/18/2012
Lincoln (Lancaster County)	Salt Creek Site 17-Antelope Creek	NE01061	Flood Control	61	7,455	8/31/2011
Rural Sprague (Lancaster County)	Salt Creek Site 2-Olive Creek	NE01062	Flood Control	46	8,590	9/22/2010
Rural Raymond (Lancaster County)	Salt Creek Site 18-Branched Oak	NE01063	Flood Control	82	122,283	10/3/2012
Rural Sprague (Lancaster County)	Salt Creek Site 4-Bluestem	NE01064	Flood Control	59	17,550	8/31/2011
Rural Valparaiso (Lancaster County)	N Oak Creek 1-A	NE01665	Flood Control	48	3,168	8/23/2012
Lincoln (Lancaster County)	Hartland Homes North Dam	NE02516	Flood Control	21	27	11/9/2012
Rural Bennet (Lancaster County)	Upper Little Nemaha 21	NE02518	Flood Control	51	2,439	3/29/2012
Lincoln (Lancaster County)	Korver Dam	NE02652	Flood Control/ Other	35	383	5/17/2012
Rural Lincoln (Lancaster County)	Stevens Creek A2-1	NE02756	Flood Control	25	256	10/3/2012
Rural Lincoln (Lancster County)	Stevens Creek A17-1	NE02757	Flood Control	38	1,127	10/3/2012
Lincoln	Village Gardens Dam	NE02805	Flood Control	26	51	10/3/2012
Lincoln (Lancaster County)	Waterford Estates Dam	NE02837	Flood Control	38	2,081	10/3/2012
Waverly (Lancaster County)	Ash Hollow Dry Dam	NE08364	None Given	None Given	None Given	None Given

Location

For the purposes of this plan inundation areas for each of the dams identified in this plan are called breach routings. Breach routings are used to help delineate the area downstream of a dam potentially impacted by inundation should that dam fail and can be used in determining the dam's hazard potential. Breach routings used in conjunction with survey and topographic data can be used to determine the anticipated depth of flooding at specific structures or facilities. Due to the nature of this threat breach mapping will not be included in this document. If members of the public wish to view EAP and breach maps for dams in the planning area a request can be made to LPSNRD, Cass and Lancaster County Department of Emergency Management, or NDNR

Extent

Lives and properties in breach areas represent a very small portion of those in the planning area. Through a review of the EAPs for the dams in the planning area it was determined that less than 5% of the population live in breach inundation areas. There are a small number of CFs located in breach areas (six CFs including a city building, county shop, and other) as well as a small number of gathering places (five parks and golf courses). While a breach of a high hazard dam would certainly impact those in breach areas the total number of people and property exposed to this threat is very low. The communities with risks related to dam failure include: Ashland, Bennet, Cedar Creek, Firth, Greenwood, Hickman, Lincoln, Louisville, Plattsmouth, Roca, and Waverly.

HISTORICAL OCCURRENCES

No incidents of dam failure were reported throughout the LPSNRD either from dams owned privately, by local or county governments, by the U.S. Army Corps of Engineers, or by LPSNRD.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

Due to lack of data and the sensitive nature of this hazard potential losses are not being calculated for this threat. Community members in the planning area that wish to quantify the threat of dam failure should contact LPSNRD, Cass or Lancaster County Department of Emergency Management, or the NDNR to view EAPs and breach inundation area maps.

VULNERABILITY ASSESSMENT

It was deemed, by both the public input and factual research that the planning area as a whole has not had previous occurrences of dam failure. The definition of dam failure for the purposes of this plan was considered 'sunny day failure,' of a full dam. This is a total dam failure in which the impounded water all flows downstream.

This was done because inundation maps are generated using this assumption. The probability of a dam failure to occur again is low with between 0 and 1 occurrence likely in a ten year span. Overall throughout the planning area, if a high hazard dam failure occurred, the majority of people and structures would not be affected by an inundation occurring as a result of a dam failure.

According to the NDNR dam database, there are thirty-four (34) high hazard dams within LPSNRD, which generally makes up the planning area. The vulnerability assessment for dam failure is discussed more specifically regarding dam failures in each jurisdiction's respective participant section. It shall be noted that the inundation maps for the high hazard dams in Nebraska are not available for public viewing because it is sensitive information. More detailed information can be sought after through the LPSNRD. EAPs and inundation areas were reviewed for the development of this plan. The planning team was very hesitant to include specific information related to dam inundation areas. It can be stated that less than 5% of structures and population are protected by dams. In addition, there are existing plans in place for the monitoring and inspection of dams.

Discussions were held with the NDNR to determine which high hazard dams could potentially inundate the incorporated cities, villages and towns within the jurisdictions of the planning area. Discussions on which dams can do this and their effects can be found in each participant section.

All dams are inspected on a regular basis and after extreme conditions have occurred. If problems are found during an inspection, the proper course of action is taken to ensure the structural integrity of the dam is preserved. In the event that dam failure is imminent, the EAP for the dam governs the course of action.

The unique characteristics of different jurisdictions allow dam failure to impact them differently. Villages, cities and SIDs are vulnerable in that structures could be inundated or destroyed and the loss of life or injury could occur. Residents in the rural areas of the counties can be affected by drought in the same way that incorporated communities are affected.

FUTURE DEVELOPMENT AND VULNERABILITY

According to the *Classification of Dams (2013)* developed and updated by NDNR, "the potential for future development must be taken into consideration when determining the hazard potential class for a dam. Any dam located in close proximity to a city or village as detailed in Table 44 must be designed to meet the requirements for a high hazard potential structure. The design requirements can be adjusted if development in the downstream breach inundation area is sufficiently curtailed due to zoning restrictions, easements, deed restrictions, or other methods of restriction acceptable to the Department."

Table 44: Dam Classification

Incorporated Class	Population	Located within or within given distance of jurisdictional limits of City of Village
Metropolitan	≥ 300,000	3 Miles
Primary	> 100,000 up to 300,000	3 Miles
First	> 5,000 up to 100,000	2 Miles
Second	> 800 up to 5,000	1 Mile
Village	100 up to 800	1 Mile

Land-use regulations should prohibit development within floodplains and areas currently protected by existing levees and dams with jurisdictions that are still able to grow. Dam failure should not be a significant threat to future development and losses should be insignificant. Communities should encourage structures currently protected by levees to purchase flood insurance from the NFIP whether they are technically located in the floodplain or not.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that dam failure has approximately a 1% chance of occurring every year, with limited impacts.

MITIGATION ALTERNATIVES

Hazard mitigation options for dam failure include most of the wide-range of actions described previously for flooding, as well as additional actions related to warning and evacuation.

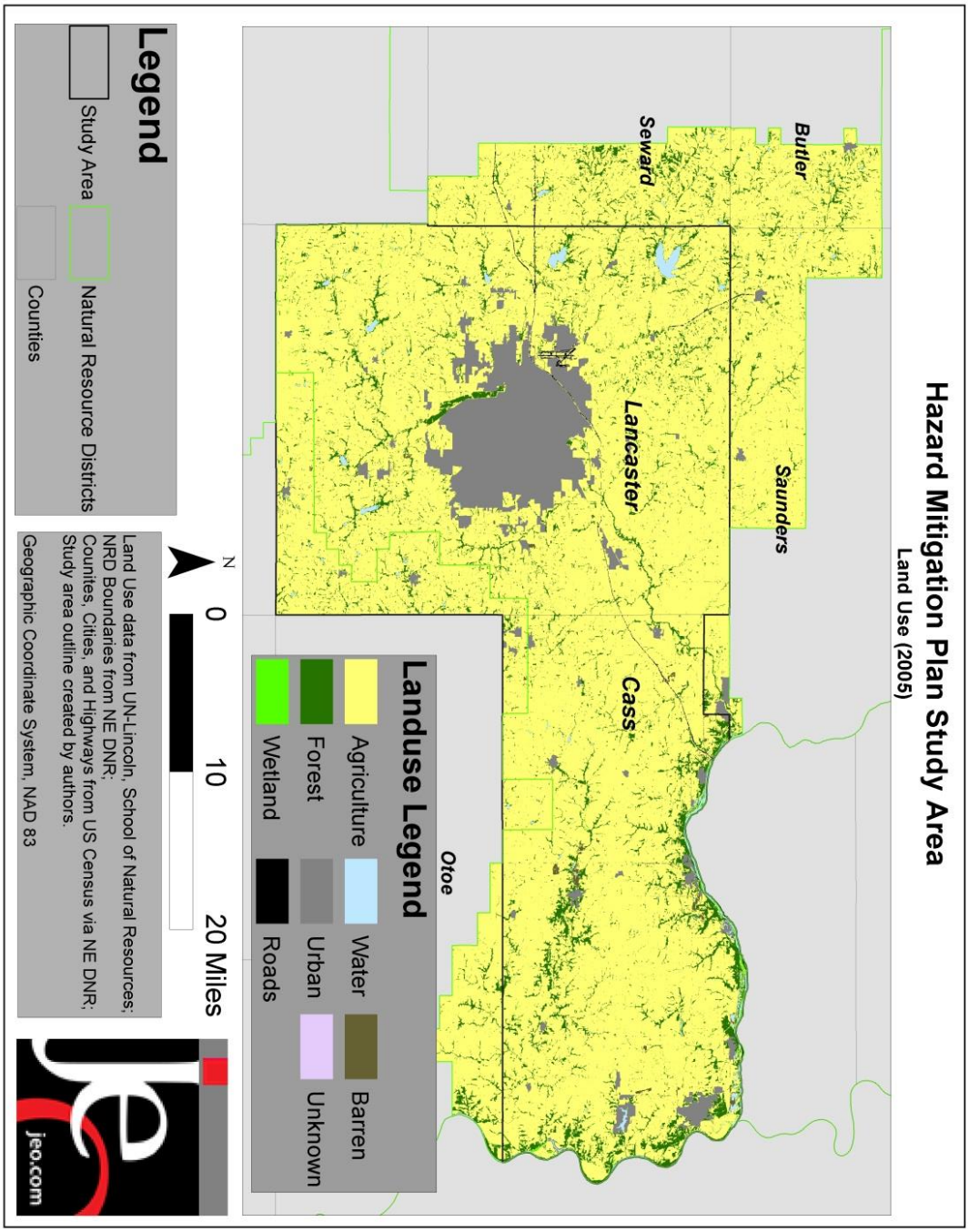
Agriculture Diseases

HAZARD PROFILE

Agriculture Disease (Ag Disease) is any biological disease or infection that can reduce the quality or quantity of either livestock or vegetative crops. This section looks at both animal disease and plant disease as both make up a significant portion of the Nebraska and the planning area's economy.

The state of Nebraska has one of the country's largest economies that is vested in both livestock and crop sales. According to the Department of Agriculture, in 2005, agriculture cash receipts totaled $11.4 billion dollars with $7.5 billion being livestock and $3.9 billion being in vegetative crops. In the state, one in three jobs are in the agriculture industry. Nebraska also totaled $2.8 billion in revenue due to agriculture exports with $498 million in livestock exports and $2.3 billion in vegetative exports.

Figure 49: Land Use in the LPSNRD



EXTENT

The likely extent of crop or livestock disease would be minor. Based on reports from participating jurisdictions most occurrences are limited in scope and geographic area. It is possible that large scale events could occur. Future updates could develop more statistics to provide a better quantification of extent related to agricultural diseases.

HISTORICAL OCCURRENCES

According to the State of Nebraska HMP Update (2011) and the Department of Agriculture the following four diseases were reported as having occurred throughout the 93 counties in Nebraska impacting livestock.

- **Chronic Wasting Disease (CWS)** – This disease was first reported in mule deer, white-tailed deer, black-tailed deer, and elk populations in the state's panhandle region beginning in 1998. Symptoms of the disease include weight loss, as well as incessant drinking and urination. An infected animal often stands listlessly, head down and ears drooping, with saliva dripping from its mouth. Between the years of 1997 and 2006 the Nebraska Game and Parks Commission confirmed 117 positive tests of CWS statewide. The livestock within the state have had no confirmed cases of the disease.

- **Vesticular Stomatitis (VS)** - In 2005, Nebraska had three horses test positive for VS. VS primarily affects cattle, horses, and swine, causing blisters on lips, tongues, and coronary bands. The blisters enlarge and break, leaving raw tissue that is so painful the animals refuse to eat or drink, and they become lame. Severe weight loss usually follows. In a herd affected by VS, nearly 90% of the animals may show clinical signs and nearly all develop antibodies. The disease is spread through direct contact between animals as well as through biting insects. If not properly handled, VS can be spread to humans and cause acute influenza like symptoms for four to seven days. There have been no new confirmed reports of VS in Nebraska since 2005.

- **Epizootic Hemorrhagic Disease (EHD)** - Commonly known as "blue tongue," is an acute, infectious, often fatal viral disease of some wild ruminants. It is characterized by extensive hemorrhaging, has been responsible for significant epizootics in deer in the northern United States and southern Canada. There have been ongoing confirmed reports of periodic outbreaks over the last fifty years in the state's deer population since the disease was first identified in 1955. All documented outbreaks of EHD have occurred during the late summer or early fall. Deer in the state's panhandle appear to be the most at risk when compared to other areas of the state. There have been no reports of EHD among the state's livestock; only wild game has been affected. The economic impact from such outbreaks could negatively impact businesses and communities that are reliant upon hunting for the majority of their sales or income.

- **Bovine Tuberculosis** - In the later stages of the disease it is easier to see the clinical symptoms of Bovine Tuberculosis. According to the USDA, symptoms include: emaciation, lethargy, weakness, anorexia, low-grade fever, and pneumonia with a chronic, moist cough. Enlarged lymph nodes may also be present. The disease gets into cattle herds by infected cattle, cervids, swine, and humans. Bovine Tuberculosis can be spread through the respiration of bacteria aerosols, contaminated feed or watering sites, or by drinking milk that is unpasteurized from infected animals. There is a high risk of contamination in enclosed areas such as barns that have poor ventilation. Bovine Tuberculosis primarily affects cattle but can be passed easily to any warm-blooded animal. In certain, but rare, conditions the disease can effect humans. In June of 2009, two beef cows in Rock County tested positive for the disease. In response to the findings, NDA staff coordinated with federal animal disease officials to properly respond. The NDA with the help of federal officials tested 21,764 head of cattle in association with the investigation. As the NDA traced cattle movement into and out of the affected herd, 61 herds of cattle were quarantined in 20 of Nebraska's 93 counties. By April 7, 2010 all but three of those herds were released from quarantine. The herd that was initially affected was also released from quarantine and endured tests that are part of the USDA federal test and remove strategy.

Between 1/1/2009 and 12/31/2009, 582 cases of the above described diseases were reported to the State of Nebraska from various counties.

Table 45 shows the population of livestock within Cass and Lancaster County. This count obviously does not include wild populations that are also at risk from agriculture diseases.

Table 45: Livestock Inventory Cass & Lancaster Counties

County	Market value of Livestock Sales	Head of Cattle	Hogs & Pigs	Chickens	Horses & Ponies	Pheasants
Cass County	**$9,992,000**	**10,848**	**5,698**	**2,514**	**634**	**--**
Lancaster County	**$27,085,000**	**23,323**	**13,207**	**3,122**	**--**	**1,981**

In regards to diseases involving animals, the NDA provides reports on diseases occurring in Cass and Lancaster Counties. Table 46 includes those diseases and numbers of occurrences within the planning area between January 1, 2013 and January 1, 2014.

Table 46: Animal Diseases Recorded by the NDA

Disease	Species Impacted	Number Of Occurrences
Anaplasmosis	Bovine	0
Bluetounge (Bovine EHD)	Bovine	8
Bovine Viral Diarrhea	Bovine	4
Caprine Arthritis/Encephalitis	Caprine/Ovine	1
Enzootic Bovine Leukosis	Bovine	1
EHD	Cervid	0
Leptospirosis	Bovine	0
Paratuberculosis	Bovine	2
Porcine Reproductive and Respiratory Disease	Porcine	3
West Nile Fever	Bovine	1

However, the above listed diseases are not the only ones that could impact animals. Information on diseases and rates of disease among “free range game” is lacking due to lack of laboratory testing, reporting, and field study.

For crops, according to the NDA, the primary crops grown throughout the state include alfalfa, corn, sorghum, soybeans, and wheat. The following table provides the value and acres planed of the top crops in the state.

Table 47: Crop Diseases Recorded by the NDA

Crop	Acres Planted	Value	U.S. Ranking in Sale
Alfalfa	2,563,515	$388,557,000	8th
Corn	9,192,656	$9,369,600,000	3rd
Sorghum	236,607	$38,690,000	4th
Soybeans	3,834,855	$2,971,658,000	7th
Wheat	1,964,302	$440,438,000	9th

Table 48: Land in and Value of Farms in Cass and Lancaster County

County	Number of Farms	Land in Farms	Market value of Crop Sales
Cass County	682	280,290	$88,160,000
Lancaster County	1,698	421,409	$98,824,000

Table 49: Crops Totals Cass & Lancaster County

Crop	Acres Planted: Cass County	Value	Acres Planted: Lancaster County	Value
Corn	114,816	$42,946,000	127,261	$46,919,000
Wheat	3,769	$826,000	16,176	2,927,000
Oats	136	NA	87	NA
Soybeans	NA	$42,132,000	NA	$40,695,000

The above list does not account for all crops in the region as there are others such as Sugar Beets, Dry Beans, Sunflowers, and Chickpeas. There are many diseases that can impact crops that vary from year to year. The Department of Agriculture provides information on some of the most common, being:

Table 50: Common Crop Diseases in Nebraska by Crop Types

Crop	Diseases	
Corn	• Anthracnose • Bacterial Stalk Rot • Common Rust • Fusarium Stalk Rot • Fusarium Root Rot • Gray Leaf Spot • Maize Chlorotic Mottle Virus	• Southern Rust • Stewart's Wilt • Common Smut • Goss's Wilt • Head Smut • Physoderma
Soybeans	• Anthracnose • Bacterial Blight • Bean Pod Mottle • Brown Spot • Brown Stem Rot • Charcoal Rot • Frogeye Leaf Spot • Phytophthora Root and Stem Rot • Pod and Stem Blight	• Purple Seed Stain • Rhizoctonia Root Rot • Sclerotinia Stem Rot • Soybean Mosaic Virus • Soybean Rust • Stem Canker • Sudden Death Syndrome
Wheat	• Barley Yellow Dwarf • Black Chaff • Crown and Root Rot • Fusarium Head Blight	• Leaf Rust • Tan Spot • Wheat Soil-borne Mosaic • Wheat Streak Mosaic
Sorghum	• Ergot • Sooty Stripe • Zonate Leaf Spot	

In addition to the viral and bacterial disease that could impact crops, pests can also result in crop loss or quality of crop. Those pests are:

- Grasshoppers,
- Western Bean Cutworm,
- European Corn Borer,
- Corn Rootworm,
- Corn Nematodes, Bean Weevil,
- Mexican Bean Beatle,
- Soybean Aphids, and
- Rootworm Beatles

With the lack of reporting and data gathering, it's hard to determine an accurate account of disease and pests that occur in livestock and plants each year.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

Due to the variable nature of the event, regional implications, duration, potential number of sectors affected it is not feasible to utilize the 'damage estimate formula' to estimate potential losses for the planning area.

VULNERABILITY ASSESSMENT

Based on research and public input it is likely that agricultural diseases will continue to impact the planning area. There have not been significant impacts reported in the planning area previously. Obviously the agricultural sector is most vulnerable to this threat, but in large incidents it is likely that costs for food and basic essentials would increase resulting in impacts to the entire population. Future updates can do more to project possible vulnerabilities and impacts

FUTURE DEVELOPMENT AND VULNERABILITY

Overall, the planning area is experiencing slight growth. However, there is a wide range of growth and decline among the individual participating jurisdictions. There are many strategies that can be undertaken to protect both existing and future assets. As development continues in the State of Nebraska and LPSNRD, most development is estimated to be urban development within municipal boundaries and little development in the land designated for agriculture use.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that agricultural disease is likely to occur annually with limited impacts.

MITIGATION ALTERNATIVES

Hazard mitigation options for agricultural diseases focus primarily on education and outreach.

Fixed Site Hazards (Chemical & Radiological)

HAZARD PROFILE

The following description for hazardous materials is provided by the FEMA:

Chemicals are found everywhere. They purify drinking water, are used in agriculture and industrial production, fuel our vehicles and machines, and simplify household chores. But chemicals also can be hazardous to humans or the environment if used or released improperly. Hazards can occur during production, storage, transportation, use, or disposal. The community is at risk if a chemical is used unsafely or released in harmful amounts.

Hazardous materials in various forms can cause fatalities, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines.

Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites.

Varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States--from major industrial plants to local dry cleaning establishments or gardening supply stores.

Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.

Hazardous material incidents are technological (meaning non-natural hazards created or influenced by humans) events that involve large-scale releases of chemical, biological or radiological materials. Hazardous materials incidents general involve releases at fixed-site facilities that manufacture, store, process or otherwise handle hazardous materials or along transportation routes such as major highways, railways, navigable waterways and pipelines.

The U.S. Environmental Protection Agency requires industry to report information on toxic chemical releases and water management activities, through the Toxics Release Inventory (TRI) Program. In the previous decade TRI reporting requirements were lessened; thereby limiting available data on chemical releases and disposal. The federal government in recent years reinstated stricter reporting requirements for industrial and federal facilities that release toxic substances with potential to threaten human health and the environment. Those requirements went into effect in April of 2009 and data from these reports is now available.

EXTENT

Fixed-sites are those that involve chemical manufacturing sites and stationary storage facilities. Table 51 demonstrates the nine classes of hazardous material according to the 2012 Emergency Response Guidebook.

Table 51: Classes of Hazardous Material

Class	Type of Material	Divisions
1	Explosives	Division 1.1 – Explosives with a mass explosion hazard Division 1.2 – Explosives with a projection hazard Division 1.3 – Explosives predominantly a fire hazard Division 1.4 – Explosives with no significant blast hazard Division 1.5 – Very insensitive explosives with a mass explosion hazard Division 1.6 – Extremely insensitive articles
2	Gases	Division 2.1 – Flammable gases Division 2.2 – Non-flammable, non-toxic gases Division 2.3 – Toxic gases
3	Flammable Liquids (and Combustible Liquids)	
4	Flammable solids; Spontaneously combustible materials	Division 4.1 – Flammable solids Division 4.2 – Spontaneously combustible materials Division 4.3 – Water-reactive substances/Dangerous when wet materials
5	Oxidizing substances and Organic peroxides	Division 5.1 – Oxidizing substances Division 5.2 – Organic peroxides
6	Toxic substances and infections substances	Division 6.1 – Toxic Substances Division 6.2 – Infectious substances
7	Radioactive Materials	
8	Corrosive Materials	
9	Miscellaneous hazardous materials/Products, Substances, or Organisms	

Based on historic record it is possible for all but Class 7 to occur within the planning area.

HISTORICAL OCCURRENCES

According to the Pipeline and Hazardous Materials Safety Administration (PHMSA), damages resultant from hazardous materials incidents total $1,205,554.00 from 1990 to 2012.

The following table provides the number of chemical spills going back to 1990 to 2012.

Table 52: Number of Fixed Site Chemical Spills

Year	Number of Chemical Spills	Number of Injuries	Total Damages	Evacuation
2012	12	0	$94,597.00	31 people evacuated
2011	7	0	$231,000.00	0
2010	4	0	$893.00	0
2009	3	0	$0.00	0
2008	11	0	$1,840.00	0
2000-2007	55	0	$596,805.00	0
1990-1999	68	3	$280,419.00	1 person evacuated

(PHMSA)

Planning team members report that on February 8, 2013 crews were working on replacing a gas vaporizer outside Conestoga High School when the propane gas line was broken. When the crews completed the replacement and charged the gas lines, propane gas leaked into the school with personnel reporting the smell of propane in the building. Three hundred and fifty students were evacuated and Hazardous Materials crews from Offutt, the Nebraska State Patrol, Cass County Sheriff and Emergency Management responded. No injuries or damages beyond the broken propane line were reported.

There are no reports of radiological incidents at fixed site locations within the Lower Platte South region.

Average Annual Damages and Frequency

Due to the variable nature of the event, regional implications, duration, and potential number of sectors affected it is not feasible to utilize the 'damage estimate formula' to estimate potential losses for the planning area. In future updates a scenario based risk assessment should be included to help quantify potential impacts.

Vulnerability Assessment

The communities of Manley and Bennet reported High vulnerability to people and CFs indicating that over 40% of their community's population and CFs could be impacted by hazardous materials incidents. The community of Valparaiso indicated a High vulnerability to CFs.

In reference to fixed-site events involving radiological materials, the overall vulnerability of population, CFs and infrastructure was low with less than 10% of people and property being impacted. The Lancaster County LEOP identifies facilities with radiological resources. The most significant threat for radiological fixed sites in the state are the Cooper Nuclear Station and the Fort Calhoun Nuclear Station. The planning area is outside of the evacuation areas for these facilities.

Individuals in close proximity to an incident could see minor to moderate health impacts depending upon the extent of the incident.

Future Development and Vulnerability

The impacts to people and property from chemical/radiological incidents are potentially severe. Most chemical/radiological transportation incidents occur on a weekday during times when day care centers and schools are likely to be in session. Other vulnerable facilities and groups include hospitals, nursing homes, and housing units with low mobility individuals and families. Vulnerable populations will live along major transportation routes or near chemical/radiological fixed site locations.

Risk Assessment Summary

Overall, the risk and vulnerability assessment shows that fixed site hazards are likely to occur annually within the planning area with limited impacts.

Mitigation Alternatives

Mitigation alternatives for this hazard include training; outreach and education; and planning to ensure that CFs are placed in lower risk areas when possible.

Transportation Incidents (Chemical, Radiological, and Severe Incidents)

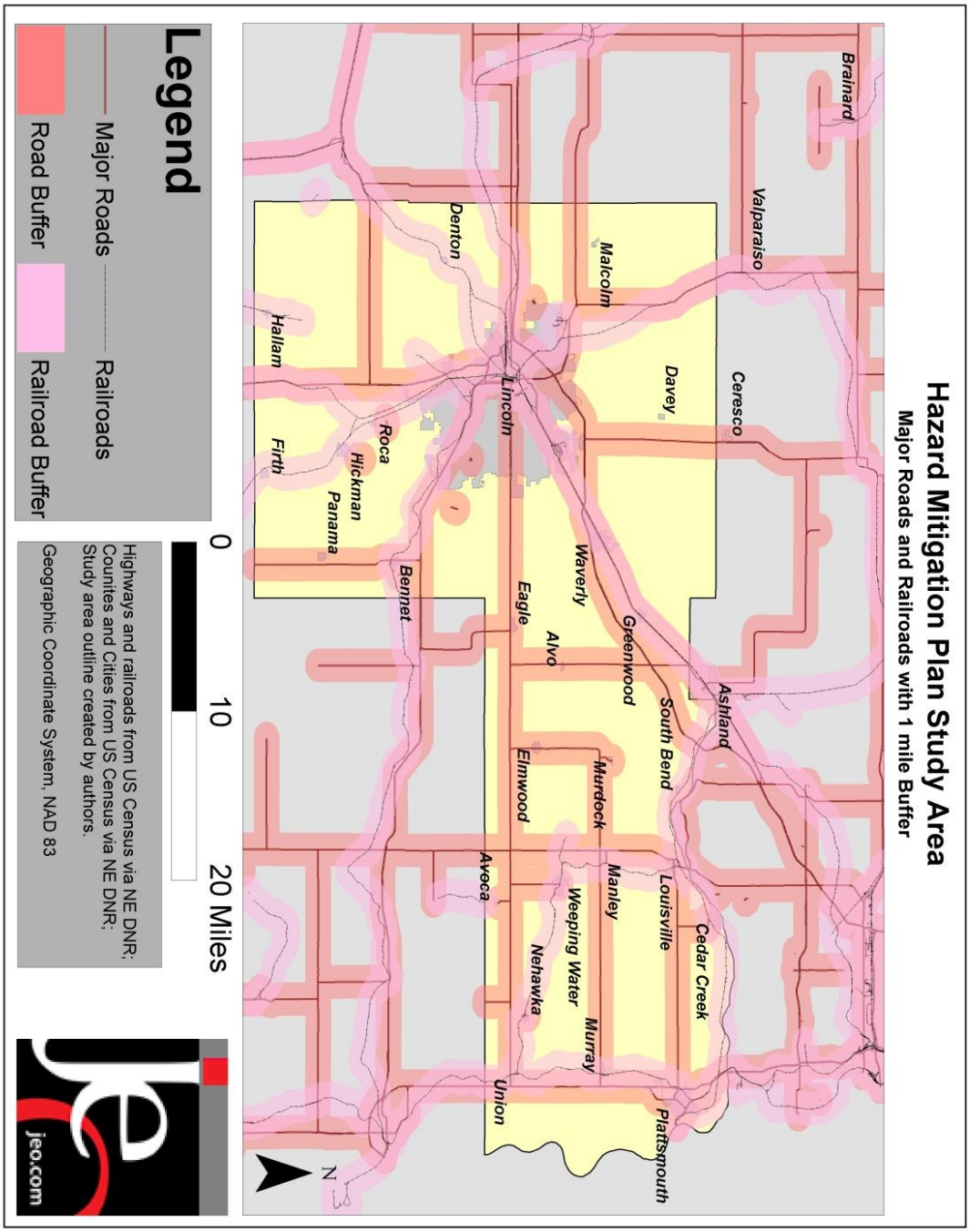
HAZARD PROFILE

The description for hazardous materials is provided by the FEMA can be found in the Fixed Site Hazards profile

EXTENT

Location

Figure 50: LPSNRD Transportation Routes



Based on historic records it is likely that any spill involving hazardous materials that occur will not affect any area larger than one mile around the spill that occurs.

HISTORICAL OCCURRENCES

In the State of Nebraska, according to the PHMSA, there have been 1,782 incidents involving hazardous materials being transported by air, highway, railway and water. These incidents involved at least 276 various forms of toxic materials across the classifications described by the Emergency Response Guidebook.

Of these 1,782 incidents, 385 of those occurred within in the planning area starting with the first reported on August 3, 1978 to October 10, 2012. During these events, there have been no fatalities, one injury requiring hospitalization, eight injuries not requiring hospitalization, and $1,883,963.00 in damages.

The following table provides a list of those events that have caused some of the most significant damages due to transportation incidents involving hazardous materials.

Table 53: Transportation Incidents Involving Hazardous Materials

Date of Event	Large Spill Events	Material Involved	Method of Transportation	Total Damage
9/29/2012	Eastbound Hwy 2 truck pulling a flatbed trailer crashed into another truck causing one container to slide off of the trailer. Lincoln/Lancaster Fire Department and Health Department responded. Hwy 2closed for 4 hours	Radioactive Materials	Highway	$86,371
5/29/2012	AT 3:54pm. Report of BNSF tank car leaking in Cass County near the Louisville State Recreation Area. Louisville SRA was evacuated; BNSF staff inspected train, no leak found.	Alcohol N.O.S.	Rail	$1,500

Date of Event	Large Spill Events	Material Involved	Method of Transportation	Total Damage
5/12/2012	Tractor-trailer struck the rear of another truck causing the load of 16 totes to move forward due to improper bracing. One tote crack open releasing the product throughout the trailer. Highway 2 closed for 4 hours.	Corrosive Liquid (Basic)	Highway	$5,000
6/9/2011	Westbound Hwy 80, truck loaded with Nutrisphere left the roadway, overturned, and discharged 250 LGA. The truck driver was taken to the hospital. Lincoln/Lancaster Fire Department, Health Department, and ESI responded to the incident.	Corrosive Liquids (N.O.S.)	Highway	$231,000
10/8/2004	Train derailment resulted in 10,200 LGA being released. The northbound lane of Hwy 77 was closed in the area for more approximately 8 hours.	Flammable Liquids (toxic)	Rail	$500,000

Date of Event	Large Spill Events	Material Involved	Method of Transportation	Total Damage
12/8/2003	Trailer overturned resulting in the release of 260 LGS of fuel oil.	Fuel Oil (NO. 1, 2,4 or 5)	Highway	$70,500
6/29/1998	Train derailment resulted in the release of 25,000 LGA of materials.	Elevated Temperature Liquid	Rail	$46,000
4/24/1995	Paint spotted leaking from a parked trailer, total release of 15 LGA.	Paint	Highway	$6,770
12/26/1994	Train derailed, one tanker car turned over resulted in the release of 23,000 LGA of Denatured Alcohol.	Denatured Alcohol	Rail	$101,050
3/1/1992	Tractor trailer overturned on westbound I80. Resulted in the release of 450 SLB of Hydrochloric Acid.	Hydrochloric Acid	Highway	$28,000

Date of Event	Large Spill Events	Material Involved	Method of Transportation	Total Damage
1/16/1992	Spill while delivering fuel to a service station. Resulted in the release of 4154 LGA of fuel oil.	Fuel Oil (NO. 1, 2, 4, 5 OR 6)	Highway	$12,054
3/10/1990	Truck overturned due to poor visibility and accidents blocking the roadway. Resulted in the release of 50 LGA of alcoholic beverages.	Alcoholic Beverages	Highway	$73,431

Source: PHMSA

There is no record of radiological releases having occurred within the planning area.

AVERAGED ANNUAL DAMAGES AND VULNERABILITY

The average damage per event estimate was determined based upon PHMSA since 1980 and number of historical occurrences of large spill events. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. According to the table below, significant chemical releases have a 36% chance of occurring per year. They would cause $35,202 per year and $96,806 per event due to hazardous material spills for the whole LPSNRD area.

Table 54: Chemical Release Loss Estimation

Hazard Type	Number of Events	Annual Frequency	Total Property Loss	Annual Property Loss[1]	Total Crop Loss	Annual Crop Loss
Transportation Incidents	12	.36	$1,161,676	$35,202	$0	$0

Source: PHMSA

VULNERABILITY ASSESSMENT

The impacts to people and property from chemical/radiological transportation incidents are potentially severe. Most chemical/radiological transportation incidents occur on a weekday during times when day care centers and schools are likely to be in session. Other vulnerable facilities and groups include hospitals, nursing homes, and housing units with low mobility individuals and families. Vulnerable populations live along major transportation routes or near chemical/radiological fixed site locations.

Most people are vulnerable to some form of transportation related incident. Homes located near airports may statistically be more vulnerable to airplane related events.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that transportation incidents are likely low impact, however there is potential for severe impacts.

MITIGATION ALTERNATIVES

Mitigation actions related to this threat include:

- Drills and exercises within potential impact zones;
    - Cass and Lancaster EMAs regularly conduct exercises related directly to chemical release incidents
- Studies to identify the primary hazardous materials transported along specific routes;
    - Highly dangerous chemicals and radiological materials are required to provide routing information
- Restrict transportation of hazardous materials at high traffic times or in high traffic areas; and
    - Transportation of chemicals in monitored
- Provide shelter-in-place kits and training for vulnerable populations such as child care and nursing homes
    - Lancaster EMA has Decon Trailer distributed throughout the county

Terrorism

HAZARD PROFILE

According to the Federal Bureau of Investigation (FBI), there is no single, universally accepted, definition of terrorism. Terrorism is defined in the CFR as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 C.F.R. Section 0.85).

The FBI further describes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. For the purpose of this report, the FBI will use the following definitions:

- Domestic terrorism is the unlawful use, or threatened use, of force or violence by a group or individual based and operating entirely within the United States or Puerto Rico without foreign direction committed against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or social objectives.

- International terrorism involves violent acts or acts dangerous to human life that are a violation of the criminal laws of the United States or any state, or that would be a criminal violation if committed within the jurisdiction of the United States or any state. These acts appear to be intended to intimidate or coerce a civilian population, influence the policy of a government by intimidation or coercion, or affect the conduct of a government by assassination or kidnapping. International terrorist acts occur outside the United States or transcend national boundaries in terms of the means by which they are accomplished, the persons they appear intended to coerce or intimidate, or the locale in which their perpetrators operate or seek asylum.

There are different types of terrorism depending on the target of attack, which are:

- Political Terrorism
- Bio-Terrorism
- Cyber-Terrorism
- Eco-Terrorism
- Nuclear-Terrorism
- Narco-terrorism

Terrorist activities are also classified based on motivation behind the event such as ideology (i.e. religious fundamentalism, national separatist movements, and social revolutionary movements). Terrorism can also be random with no ties to ideological reasoning.

The FBI also provides clear definitions of a terrorist incident and prevention:

- A terrorist *incident* is a violent act or an act dangerous to human life, in violation of the criminal laws of the United States, or of any state, to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.

- Terrorism *prevention* is a documented instance in which a violent act by a known or suspected terrorist group or individual with the means and a proven propensity for violence is successfully interdicted through investigative activity.

Note: *The FBI investigates terrorism-related matters without regard to race, religion, national origin, or gender. Reference to individual members of any political, ethnic, or religious group in this report is not meant*

to imply that all members of that group are terrorists. Terrorists represent a small criminal minority in any larger social context.

Primarily, threat assessment, mitigation and response to terrorism are federal and state directives and work primarily with local law enforcement. The Office of Infrastructure Protection within the Federal DHS is a component within the National Programs and Protection Directorate.

The Office of Infrastructure Protection leads the coordinated national program to reduce and mitigate risk within 18 national CIKR sectors from acts of terrorism and natural disasters and to strengthen sectors' ability to respond and quickly recover from an attack or other emergency. This is done through the National Infrastructure Protection Plan (NIPP).

Under the NIPP, a Sector-Specific Agency (SSA) is the federal agency assigned to lead a collaborative process for infrastructure protection for each of the 18 sectors. The NIPP's comprehensive framework allows the Office of Infrastructure Protection to provide the cross-sector coordination and collaboration needed to set national priorities, goals, and requirements for effective allocation of resources. More importantly, the NIPP framework integrates a broad range of public and private CIKR protection activities.

The Sector-Specific Agencies provide guidance about the NIPP framework to state, tribal, territorial and local homeland security agencies and personnel. They coordinate NIPP implementation within the sector, which involves developing and sustaining partnerships and information-sharing processes, as well as assisting with contingency planning and incident management.

The Office of Infrastructure Protection has Sector-Specific Agency responsibility for six of the 18 CIKR sectors. Those six are:

- Chemical
- Commercial Facilities
- Critical Manufacturing
- Dams
- Emergency Services
- Nuclear Reactors, Materials and Waste

Sector-Specific Agency responsibility for the other 12 CIKR sectors is held by other DHS components and other federal agencies. Those 12 are:

- Agriculture and Food – Department of Agriculture; Food and Drug Administration
- Banking and Finance – Department of the Treasury
- Communications – DHS
- Defense Industrial Base – Department of Defense
- Energy – Department of Energy
- Government Facilities – DHS
- Information Technology – DHS
- National Monuments and Icons – Department of the Interior
- Postal and Shipping – Transportation Security Administration
- Healthcare and Public Health – Department of Health and Human Services
- Transportation Systems – Transportation Security Administration; U.S. Coast Guard
- Water – Environmental Protection Agency

The NIPP requires that each Sector-Specific Agency prepare a Sector-Specific Plan, review it annually, and update it as appropriate.

The DHS and its affiliated agencies are responsible for disseminating any information regarding terrorist activities in the country. The system in place is the National Terrorism Advisory System (NTAS). NTAS replaced the Homeland Security Advisory System (HSAS) which was the color coded system put in place after the September 11th attacks by Presidential Directive 5 and 8 in March of 2002. NTAS replaced HSAS in 2011.

NTAS is based on a system of analyzing threat levels and providing either an imminent threat alert or an elevated threat alert.

An ***Imminent Threat Alert*** warns of a credible, specific and impending terrorist threat against the United States.

An ***Elevated Threat Alert*** warns of a credible terrorist threat against the United States.

The DHS, in conjunction with other federal agencies, will decide whether a threat alert of one kind or the other should be issued should credible information be available.

Each alert provides a statement summarizing the potential threat and what, if anything should be done to ensure public safety.

The NTAS Alerts will be based on the nature of the threat: in some cases, alerts will be sent directly to law enforcement or affected areas of the private sector, while in others, alerts will be issued more broadly to the American people through both official and media channels.

An individual threat alert is issued for a specific time period and then automatically expires. It may be extended if new information becomes available or the threat evolves. The ***sunset provision*** contains a specific date when the alert expires as there will not be a constant NTAS Alert or blanket warning that there is an overarching threat. If threat information changes for an alert, the Secretary of Homeland Security may announce an updated NTAS Alert. All changes, including the announcement that cancels an NTAS Alert, will be distributed the same way as the original alert.

EXTENT

Location

Due to the often times unforeseen nature of terrorist events, all CFs in the LPSNRD are at risk and vulnerable to terrorism.

HISTORICAL OCCURRENCES

Since January 1, 1980 there have been 104,000 terrorist incidents throughout the world with 1,005 of those occurring within the borders of the United States. The costliest terrorist incidents in United States history were the events of September 11, 2001 at the World Trade Center, the Pentagon, and Shanksville, Pennsylvania. Events that have occurred in the planning area meeting the definition of ‘terrorism’ include five incidents, all of which are centered on government buildings and the University of Nebraska.

Table 55: Terrorist Events

Date	Event	Area Impacts	Results	Injuries
06/12/13	White Powder Discovered in an Envelope	Nebraska Department of Motor Vehicles	Evacuation of DMV	None
01/21/13	White powder in an envelope	Apothecary Building, Lawyer's office	None	None
02/24/11	Gunman on UNL's East Campus	University of Nebraska-Lincoln, East Campus and Wesleyan College Campus	Campus locked down for 90 minutes	None
12/04/07	White powder in an envelope	Immigration and Naturalization Service Building	None	None
06/09/05	Powder Discovered in the mailroom	Immigration and Naturalization Service Building	Evacuation of INS	None

Average Annual Damages and Frequency

The "damage estimator" was not used for this hazard due to lack of data and historic impacts.

Vulnerability Assessment

Given the sensitive nature of this threat a full vulnerability assessment was not completed. It should be noted that there are currently plans, procedures, and monitoring in place related to this threat.

Future Development and Vulnerability

The impacts to people and property from terrorist incidents are potentially severe. Most terrorist incidents occur on a weekday when governmental, business, and other CFs are staffed to inflict the most damage, injuries, and fatalities possible. It is important that CFs be protected; in many of the villages in the planning area this could mean fences around water towers and wells or vehicular barriers around schools and community facilities.

Risk Assessment Summary

Overall, the risk and vulnerability assessment shows that events meeting the definition of Terrorism have a 55% chance to occur per year. Past impacts due to terrorism in the planning area have historically been minimal. However, impacts have the potential to be severe.

Mitigation Alternatives

Mitigation alternatives for terrorism include:

- Training and exercises;
- Education and outreach;
- Vehicular barrier and other building protection measures; and
    - Identified by multiple jurisdictions as a potential project
    - City of Lincoln already has these located at the Federal Building and other CFs throughout the community
- General awareness raising programs such as "See Something, Say Something."

Civil Disorder

HAZARD PROFILE

Civil disorder, also known as civil unrest or civil strife, is a broad term that is typically used by law enforcement to describe one or more forms of unrest caused by a group of people. Civil disturbance is typically a symptom of, and a form of protest against, major socio-political problems; the severity of the action coincides with public expression(s) of displeasure. Examples of civil disorder include, but are not necessarily limited to: illegal parades; sit-ins and other forms of obstructions; riots; sabotage; and other forms of crime. It is intended to be a demonstration to the public and the government, but can escalate into general chaos.

EXTENT

Location

Instances of civil disorder can occur anywhere at any time throughout the United States and more specifically throughout the LPSNRD. According to history, the most likely location of occurrence is at governmental offices and other gathering sites for large crowds such as sports arenas. The city of Lincoln has both governmental offices at the state and federal levels and two large sports arenas, Memorial Stadium and Pinnacle Bank Arena.

Based on historic record it is likely that any event of civil disorder in the planning area will remain peaceful.

HISTORICAL OCCURRENCES

Throughout American history civil disorder, at times, has been a part of our society. Since the 18th Century, there have been 349 recorded instances of civil disorder, with three occurring under the Articles of Confederation and then under the Constitution.

More recently, since 2010, there have been at least sixteen recorded incidents of civil disorder involving issues ranging from protests over economic injustice, sporting events and their outcomes, and racial incidents.

One in particular that garnered much news coverage is the Occupy Wall Street Movement that began around September 2011 in Zuccotti Park in New York City's financial district. The main issues raised by Occupy Wall Street were social and economic inequality, greed, corruption and the perceived undue influence of corporations on government—particularly from the financial services sector. Protesters were forced out of Zuccotti Park on November 15, 2011. After several unsuccessful attempts to re-occupy the original location, protesters turned their focus to occupying banks, corporate headquarters, board meetings, and college and university campuses. Occupy Wall Street Protests also took place in Brooklyn, New York and Oakland, California.

There is one instance of civil disorder in the planning area. From October 2011 to May 2012 Occupy Lincoln protesters were camped across the street from the state capital building in a city park.

AVERAGE ANNUAL DAMAGES AND FREQUENCY

The "loss estimator" was not used for this hazard due to lack of data and historic impacts.

VULNERABILITY ASSESSMENT

The future vulnerability to civil disorder for the planning area is low with the potential for occurrence zero to one time in the next 10 years.

FUTURE DEVELOPMENT AND VULNERABILITY

The impact to people and property from civil disorder is low as most protests are peaceful and generally dissipated by police without event. However, increases in population can proportionally increase the risk of major conflicts between police and protestors during instances of civil disorder.

In regards to structures and infrastructure, new structures and infrastructure developed in the future will be as equally vulnerable to potential civil disorder incidents as existing structures and infrastructure. Surveillance and defensible space could be used in the future to help deter this action.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that civil disturbance has a 5% chance of occurring every year with limited impacts.

MITIGATION ALTERNATIVES

Mitigation alternatives include training and education, as well as the use of vehicular barriers and other mechanisms to protect CFs.

Urban Fire

HAZARD PROFILE

Urban fires are classified as "uncontrolled burning in a residence or building from natural, human or technical causes". These fires have a potential to spread to adjoining structures. Local city and county fire departments are tasked with the response and control of urban fires. According to the State Fire Marshall Office, a report provided in July, 2013 lists 64 fire departments that are located within the Lower Platte South region.

According to the United States Fire Administration, fire risk "varies from region to region in the United States. This often is a result of climate, poverty, education, demographics, and other causal factors. Often times, all that is needed to cause an uncontrolled urban fire is a heat source to spark a fire, flammable materials that act as a fuel source, and oxygen.

EXTENT

Within the State of Nebraska, and LPSNRD specifically, urban fires can occur throughout the region. Incidents will likely be more severe in dense areas.

HISTORICAL OCCURRENCES

In Nebraska in a given year, based on the number of fires reported to the Nebraska State Fire Marshal between 2008 and 2012, the average number of fires is 1,124 a year with an average of $14,746,721 in damages per year. In 2012 Cass County fire departments reported a total of 42 fires, for Cass County Plattsmouth's fire department was the only reporting entity. For Lancaster County there were 807 reported fires with five reporting departments. For Lancaster County there was also a reported 1,158 false alarm calls. Local fire departments are encouraged to report annual calls to the Nebraska Fire Marshal's Office. While this is encouraged it is not required. Table 56 shows the number and nature of calls responded to by county from 2008 – 2012.

Table 56: Calls Responded to by Fire Departments within the Planning Area

Fire Department	Fire	Over Pressure Rupture	Rescue/ EMS	Haz Mat	Service Calls	Good Intent Calls	False Alarms	Severe Weather	Special Incidents
Bennet Rural Fire District	0	0	0	0	0	0	0	0	0
Firth Rural Fire District	64	1	244	7	16	50	21	2	1
Hallam Vol. Fire and Rescue	61	0	16	9	1	3	11	0	1
Hickman Rural Fire and Rescue	143	0	555	16	25	141	51	3	2
Lincoln Fire and Rescue	1,927	264	490	2,234	4,505	2,392	5,190	55	661
Malcolm Fire and Rescue	0	0	0	0	0	0	0	0	0

Fire Department	Fire	Over Pressure Rupture	Rescue/ EMS	Haz Mat	Service Calls	Good Intent Calls	False Alarms	Severe Weather	Special Incidents
Raymond Vol. Fire and Rescue	202	0	571	23	16	28	15	1	0
Southeast Rural Fire District	0	0	0	0	0	0	0	0	0
Southwest Rural Fire District	0	0	38	0	0	0	0	2	0
Waverly Fire and Rescue	171	0	860	35	58	143	54	1	1
Lancaster County	**2,568**	**264**	**2,774**	**2,323**	**4,621**	**2,757**	**5342**	**64**	**666**
Alvo Vol. Fire and Rescue	0	0	0	0	0	0	0	0	0
Avoca Rural Fire District	5	0	3	4	1	0	0	0	0
Cedar Creek Vol. Fire Dept.	0	0	0	0	0	0	0	0	0
Eagle Fire and Rescue	0	0	1	0	0	0	0	0	0
Elmwood Vol. Fire Dept.	0	0	0	0	0	0	0	0	0
Greenwood Vol. Fire and Rescue	26	0	99	9	2	117	0	3	1
Louisville Vol. Fire and Rescue	0	0	0	0	0	0	0	0	0
Manley Fire Dept.	0	0	0	0	0	0	0	0	0
Murdock Vol. Fire Dept.	0	0	0	0	0	0	0	0	0
Murray Fire and Rescue	0	0	0	0	0	0	0	0	0
Nehawka Rural Fire Dept.	7	0	20	2	3	1	1	6	0
Fire Department	**Fire**	**Over Pressure Rupture**	**Rescue/ EMS**	**Haz Mat**	**Service Calls**	**Good Intent Calls**	**False Alarms**	**Severe Weather**	**Special Incidents**

Plattsmouth Vol. Fire Dept.	152	7	317	197	52	47	133	6	1
Union Vol. Fire Dept.	1	0	0	1	0	0	0	0	0
Weeping Water Vol. Fire Dept.	1	1	8	2	0	0	0	0	1
Cass County	**185**	**8**	**448**	**215**	**58**	**164**	**134**	**15**	**3**
Ashland Fire Dept.	135	0	157	27	41	85	40	1	9
Brainard Vol. Fire Dept.	37	1	2	0	0	0	0	0	0
Ceresco Vol. Fire and Rescue	0	0	0	0	0	0	0	0	0
Valparaiso Fire and Rescue	0	0	0	0	0	0	0	0	0
LPSNRD	**2,925**	**273**	**3,381**	**2,565**	**8,101**	**3,006**	**5,516**	**80**	**678**

AVERAGE ANNUAL DAMAGES AND FREQUENCY

The "loss estimator" was not used for this hazard due to lack of data for the region.

VULNERABILITY ASSESSMENT

Fire death rates are based on all deaths in which exposure to fire, fire products, or explosion was the underlying cause of death or was a contributing factor in the chain of events leading to death."

According to the U.S. Fire Administration, "older adults (age 65 or older) were at higher risk from dying in a fire than the rest of the population. The very young (age 4 or younger) were also at higher risk of fire death and injury when compared to older children. Males, African-Americans, and American Indians/Alaska Natives also had a considerably higher risk of death from fire than did the population as a whole."

Because of the nature of urban fires, any structure identified in the planning are could possibly be damaged or destroyed by a fire for one of any number of reasons ranging from faulty or outdated electrical infrastructure, lightning strikes to accidents such as stoves being left on. As already stated, the threat of urban fires in populated areas is not only confined to the structure that initially caught on fire but to those surrounding the burning structure.

Fire death rates are based on all deaths in which exposure to fire, fire products, or explosion was the underlying cause of death or was a contributing factor in the chain of events leading to death." The following table was provided by the U.S. Fire Administration to depict death rates for the State of Nebraska.

Table 57: Death Rates Resulting from Fire in Nebraska

STATE	2005 Death Rate/Million Population	2006 Death Rate/Million Population	2007 Death Rate/Million Population	2008 Death Rate/Million Population	2009 Death Rate/Million Population	2010 Death Rate/Million Population
Nebraska	17.1	17.0	12.4	12.9	7.8	9.8

FUTURE DEVELOPMENT AND VULNERABILITY

Any future development that occurs in the region with respect to residential and non-residential structures has the potential for fire damage or destruction. The use of building codes, Fire Wise building practices will reduce some of the damages that could occur or reduce the risk that neighboring structures catch fire as easily. In any scenario, the risk of urban fire is high for the planning area as with any other populated area across the nation.

RISK ASSESSMENT SUMMARY

Overall, the risk and vulnerability assessment shows that urban fire is likely to occur several times annually, and is most likely to impact the denser communities in the planning area.

MITIGATION ALTERNATIVES

The use of building codes, community education, and Fire Wise building practices will reduce some of the damages that could occur or reduce the risk that neighboring structures catch fire as easily.

Hazards Not Profiled

For the planning area there have been no reported incidents related to expansive soils, sink holes, or landslides. For that reason these events have not been profiled for this plan. Should these hazards occur in the planning area they should be profiled in future updates.

Section Five: Mitigation Strategy

Summary of Changes

This section has been updated to reflect changes in prioritization and needs within the participating jurisdictions. This section contains: completed mitigation projects, an update of previously identified projects, and the addition of new projects and strategies that have been identified. The STAPLEE process remained consistent with that which was used previously.

Introduction

The primary focus of the mitigation strategy is to establish goals objectives, and identify action items to reduce the effects of hazards on existing infrastructure and property in a cost effective and technically feasible manner. The development of goals and objectives was completed through the 'hazard identification' public meetings.

Meeting participants reviewed the goals from the 2008 HMP and discussed recommended additions and modifications. The intent of each goal and set of objectives was to develop strategies to account for the risks associated with the hazards, and identify ways to reduce or eliminate those risks. Each goal and set of objectives is preceded by 'mitigation alternatives' or actions items.

A preliminary list of goals and objectives that came from the 2008 HMP was provided to the planning team and participants at the 'hazard identification' public meetings. Each participant was asked to review all of the goals and objectives and comment on how to improve or change them to meet the needs of their jurisdiction. Information from this review was used to finalize the goals and objectives.

Development of Goals

Below is the final list of goals and objectives as determined by the participants and planning team. These goals and objectives provide specific direction to guide participants in reducing future hazard related losses. The goals and objectives were numbered to assist in the development and organization of mitigation alternatives 'action items', as discussed in *Section 6: Participant Section*.

***Requirement §201.6(c)(3)(i)**: [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

***Requirement §201.6(c)(3)(ii)**: [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

***Requirement: §201.6(c)(3)(ii)**: [The mitigation strategy] must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.*

***Requirement: §201.6(c)(3)(iii)**: [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

***Requirement §201.6(c)(3)(iv)**: For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Goal 1: Protect the Health and Safety of Residents

Objective 1.1: Reduce or prevent damage to property or prevent loss of life or serious injury (overall intent of the plan).

Goal 2: Reduce Future Losses from Hazard Events

Objective 2.1: Provide protection for existing structures, future development, CFs, services, utilities, and trees to the greatest extent possible.

Objective 2.2: Develop hazard specific plans, conduct studies or assessments, and retrofit jurisdiction to mitigate for hazards and minimize their impact.

Objective 2.3: Minimize and control the impact of hazard events through enacting or updating ordinances, permits, laws, or regulations.

Goal 3: Increase Public Awareness and Educate on the Vulnerability to Hazards

Objective 3.1: Develop and provide information to residents and businesses about the types of hazards they are exposed to, what the effects may be, where they occur, and what they can do to be better prepared.

Goal 4: Improve Emergency Management Capabilities

Objective 4.1: Develop or improve Emergency Response Plan and procedures and abilities.

Objective 4.2: Develop or improve Evacuation Plan and procedures.

Objective 4.3: Improve warning systems and ability to communicate to residents and businesses during and following a disaster or emergency.

Goal 5: Pursue Multi-Objective Opportunities (whenever possible)

Objective 5.1: When possible, use existing resources, agencies, and programs to implement the projects.

Objective 5.2: When possible implement projects that achieve several goals.

Mitigation Alternatives (Action Items)

After the establishment of each participant's goals and objectives, mitigation alternatives were prioritized. The alternatives considered included: the mitigation actions in the previous plan; additional mitigation actions discussed during the planning process; actions identified in FEMA's *Mitigation Ideas: A Resource for Reducing Risk to Natural* Hazards, and recommendations from JEO for additional mitigation actions. In addition, JEO provided each participant a preliminary list of mitigation alternatives to be used as a starting point. The prioritized list of alternatives helped participants determine which actions will best assist their respective jurisdiction in alleviating damages in the event of a disaster. The listed priority does not indicate which actions will be implemented first, but will serve as a guide in determining the order at which each action should be implemented.

These projects are the heart of a HMP. The group was instructed that each alternative must be directly related to the goals and objectives. Alternatives must be specific activities that are concise and can be implemented individually.

Mitigation alternatives were evaluated using FEMA's STAPLEE process, as this process addresses all the major factors when weighing the costs to the benefits of implementing one action over another. Important factors when ranking the alternatives include the prohibitive costs, the communities' resource capabilities, the communities' desire and concerns, and feasibility. STAPLEE evaluation includes consideration of the social, technical, administrative, political, legal, economic and environmental benefits of the mitigation actions. STAPLEE criteria taken from FEMA's Multi-Hazard Mitigation Planning Guidance (July 2008) are summarized below.

S – Social: Mitigation actions are acceptable to the jurisdiction if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the jurisdictions social and cultural values.

T – Technical: Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.

A – Administrative: Mitigation actions are easier to implement if the jurisdiction has sufficient staffing and funding.
P – Political: Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support of the action.
L – Legal: It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E – Economical: Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.
E – Environmental: Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with federal, state, and local environmental regulations, and that are consistent with the jurisdiction's environmental goals, have mitigation benefits while being environmentally sound.

Participants received a worksheet to assist them in scoring the priority of each alternative. Most participants took additional worksheets back to their communities. The key personnel and members attending the public meeting were asked to provide a designation of '+', '-', or 'O' for each STAPLEE criteria which was used to come up with a cumulative priority ranking that maximizes the benefits of each alternative. This cumulative priority ranking was created by assigning a value of 1 each +, -1 to each -, and 0 to each O. The cumulative ranking was then created by adding the numbers under each STAPLEE criteria.

A final list of alternatives was established including information on the associated hazard mitigated, description of the action, responsible party, priority, cost estimate, potential funding sources, and timeline. This information was established through input from participants and determination by the consultant.

It is important to note that not all of the mitigation actions identified may ultimately be included in the community's plan due to limited capabilities, prohibitive costs, low benefit/cost ratio, or other concerns. Even though there are cost estimates, priority scores, and responsible agencies identified, planning participants have not necessarily committed to undertaking any of the activities. This information will serve as a guide for the participants to assist in hazard mitigation for the future. Additionally, some jurisdictions may identify additional mitigation actions not identified by the county.

PARTICIPANT MITIGATION ALTERNATIVES

The following are specific actions listed by participants of the LPSNRD plan intended to be utilized in the implementation of mitigation alternatives. Each action is described by the following:

- Description – general summary of the action item.
- Analysis – brief summary of what the action item will accomplish.
- Goal/Objective – which goal and objective the action item falls under.
- Hazard(s) Addressed – which hazard the mitigation action aims to address.
- Potential funding – a list of any potential funding mechanism used to fund the action.
- Timeline – a general timeline as established by planning participants and the planning team.
- Priority – based upon the STAPLEE process a general description of the importance and workability in which an action may be implemented (high/medium/low). Priority may vary between each community, mostly dependent on funding capabilities and the size of the local tax base.
- Lead agency – listing of agencies which may lead the implementation of the action item.

Implementation of the actions will vary between individual plan participants based upon the availability of existing information, funding opportunities and limitations, and administrative capabilities of smaller communities. The information listed in Table 60 is a compilation of the mitigation alternatives organized by the goal and objective to be met. Establishment of a cost-benefit analysis is out of the scope of this plan and could potentially be completed prior to submittal of a project grant application or as part of a 5-year update.

Ongoing and highly ranked mitigation alternatives for each participating jurisdiction can be found in *Section 7: Participant Sections.*

MITIGATION ALTERNATIVE PROJECT MATRIX

During public meetings, each participant was asked to review potential mitigation alternatives from the 2008 HMP and some new projects based on FEMA's best practices manual which would lead to action items to reduce the effects of natural hazards. The participant then scored indicated whether the project would have a positive, negative, or neutral for each of the STAPLEE category. Participants also indicated if there were projects they did not want. Actions selected varied from community to community dependent upon the significance of each hazard present.

Table 58: Mitigation Alternative Projects

Goal/ Objective	Action Item #	Action Item	Summary	Hazards Addressed	Responsible Department/Agency
Goal 2 Objective **2.1**	**2.1.1**	Relocate Municipal Infrastructure	Acquire Graphical Information System (GIS) to relocate municipal infrastructure (water and sewer lines)	All hazards	County
	2.1.2	City Well Back-up	Backup generator for city wells	All hazards	City/Village
	2.1.3	Central Emergency Shelter	Build a central emergency shelter that contains food, storage space, and heat	All hazards	City/Village
	2.1.4	Bury Utility Lines	Bury electric, power, service lines	All natural hazards	City/Village
	2.1.5	New Well	Construct a new well to assist with fire protection and drought	Drought, wildfire	City/Village
	2.1.6	Safe Rooms	Construct safe rooms for CFs	All hazards	City/Village
	2.1.7	Promote Infiltration	Convert concrete-lined channels to natural channels to promote infiltration	Flooding	City/Village
	2.1.8	Drainage Ditches	Deepen drainage ditches and clean out culverts	Flooding	City/Village
	2.1.9	Chemical Incident Sheltering	Ensure that all CFs, businesses, and residents located near major transportation corridors and near fixed site chemical facilities are aware of how to safely shelter in place in the event of a chemical incident	Chemical/Radiological Fixed Sites/Facilities, Transportation Incidents	EM
	2.1.10	Safe Rooms	Ensure that CFs have safe rooms to protect first responders, city staff, and the public	All hazards	City/Village
	2.1.11	Protection of Vulnerable Populations	Ensure that facilities which will house vulnerable populations are placed in the least vulnerable areas of the community	All hazards	City/Village
	2.1.12	Fuel Tank Anchoring	Ensure that fuel tanks are anchored	All hazards	City/Village
	2.1.13	Relocation of Hazardous Storage	Explore a plan and funding for relocation of tanks and hazardous storage	Fixed Sites	City/Village
	2.1.14	Facility Floodproofing	Explore the possibility of floodproofing for facilities which fall into the HAZUS 1% flood inundation areas	Flooding	Floodplain Admin
	2.1.15	Levees and Floodwalls	Explore the use of levees and floodwalls	Flooding	City/Village
	2.1.16	Improve Drainage	Improve drainage patterns in and around the community	Flooding	City/Village

Goal/ Objective	Action Item #	Action Item	Summary	Hazards Addressed	Responsible Department/Agency
	2.1.17	High-Risk Properties	Improve or acquire property that is high-risk to flooding	Flooding	City/Village
	2.1.18	Improve Drainage	Improve storm sewers and drainage patterns in and around the community	Flooding	City/Village
	2.1.19	Well Improvement	Improve village well system	Drought	City/Village
	2.1.20	Emergency Generator	Install an emergency generator at the community center used for mass care	All hazards	Public Works
	2.1.21	Vehicular Barriers	Install vehicular barriers to protect CFs and key infrastructure where possible	All hazards	City/Village
	2.1.22	Bank Stabilization	Platte River bank stabilization	Flooding	NRD
	2.1.23	Preserve Floodplain	Preserve natural and beneficial functions of floodplain land through measures such as retaining natural vegetation, restoring streambeds, and preserving open space in the floodplain	Flooding	County
	2.1.24	Protect Water Treatment	Protect the city's new water treatment facility	All hazards	City/Village
	2.1.25	Back-up Power	Provide backup power systems to provide redundant power supply	All hazards	City/Village
	2.1.26	New Chipper	Purchase a new chipper to help rid village of debris	Strong winds, severe winter storms, severe thunderstorms, tornado	City/Village
	2.1.27	Snowplow	Purchase additional snowplow	Severe Winter Storms	City/Village
	2.1.28	Back-up Generator	Purchase generators for public buildings (auditorium, fire station, etc.)	All hazards	City/Village
	2.1.29	Back-Up Power	Set up transfer switches and have generators for the grade school and or legion hall	All hazards	Emergency Management
	2.1.30	Tree Inventory	Tree inventory to ID problem trees that loose or drop branches	Severe thunderstorms, high winds, tornados, severe winter storms	City/Village
	2.1.31	Emergency Operations	Update EOC	All hazards	Emergency Management
	2.1.32	Storm Water Management	Upgrade combined sewer system to improve storm water management	Flooding	City/Village
	2.1.33	Vulnerable Population Database	Work with stakeholders to develop a database of vulnerable populations and the organizations which support them	All hazards	City/Village
	2.1.34	Channel Improvements	Channel Improvements : Cornhusker Highway; University of Nebraska East Campus; University Place Park; 52nd Street to 56th Street	Flooding	City/Village
	2.1.35	Stormwater Detention	Stormwater Detention: Upstream of 56th street	Flooding	City/Village
Goal 2 Objective 2.2	**2.2.1**	Municipal Wells	Additional municipal wells	Drought	County
	2.2.2	No Adverse Impact	Adopt a No Adverse Impact approach to floodplain management	Flooding	City Council
	2.2.3	Continuity Plan	Develop continuity plans for critical community services	All hazards	City/Village
	2.2.4	Services in Flooding Events	Develop strategies to provide necessary services in the event of flooding	Flooding	City/Village

Goal/ Objective	Action Item #	Action Item	Summary	Hazards Addressed	Responsible Department/Agency
	2.2.5	Hail Resistant Roofing	Encourage the use of hail resistant roofing for any new construction	Hailstorm	city/village/ inspector/building code
	2.2.6	Water Supply	Investigate new sources of water supply (possible well field and additional above ground storage)	Drought	NRD
	2.2.7	Alternate Water System	Study alternate water sources in event of water system failure	Drought	City/Village
	2.2.8	Hazardous Spill	Utilize exercise to prepare for potential explosions or hazardous spills. Ensure that nearby business and residents have appropriate plans in place.	Fixed Sites	City/Village
	2.2.9	Flooding Master Plan	Complete a jurisdiction wide Master Plan to prioritize all flooding related projects	Flooding	City/Village
	2.2.10	GPS System	GPS system		
	2.2.11	Conservation Plan	Develop a conservation plan that includes knowledge of regional areas	All hazards	City/Village
Goal 2 Objective 2.3	**2.3.1**	Low Impact Development	Utilize Low Impact Development practices and Green Infrastructure to reduce flood risk	Flooding	City/Village
	2.3.2	Tree City USA	Assist Cities and Villages seeking Tree City USA designation	High winds, tornados, severe winter storms, severe thunderstorm	Zoning
	2.3.3	Community Ratings System	Maintain/Become a CRS (Community Ratings System) community to reduce flood insurance premiums	Flooding	City/Village
	2.3.4	Tree Planting	City tree planting and maintenance	High winds, tornados, severe winter storms, severe thunder storms	City Parks and Recreation
	2.3.5	Tree City USA	Continue participating in Tree City USA designation	All hazards	City/Village
	2.3.6	Conservation guidelines	Develop conservation guidelines or requirements	Drought	City/Village
	2.3.7	Tree City USA	Maintain Tree City USA designation	Severe thunderstorms, high winds, tornados, severe winter storms	Parks and Recreation
	2.3.8	NFIP	Maintain good standing with the NFIP	Flooding	City/Village
	2.3.9	Tree City USA	Obtain Tree City USA designation	Severe thunderstorms, high winds, tornados, severe winter storms	City/Village
	2.3.10	Back-up Municipal Records	Establish a policy for micro-filming of pertinent municipal records	All hazards	City/Village
	2.3.11	FIRMS	Update FIRMs	All hazards	FEMA
Goal 3 Objective 3.1	**3.1.1**	Public Information	Develop public information documents	All hazards	City/Village
	3.1.2	Business Continuity Planning	Educate local businesses on the value of continuity planning	All hazards	City/Village
	3.1.3	Tree Assistance	Educate public on appropriate tree planting and establish an annual tree trimming program to assist low income and elderly	High winds, tornados, severe winter storms, severe thunderstorms	City/Village
	3.1.4	Green Mitigation	Educate the public and business owners regarding rain gardens, green roofs, and other minor mitigation measures	All hazards	City/Village

Goal/ Objective	Action Item #	Action Item	Summary	Hazards Addressed	Responsible Department/Agency
	3.1.5	Water Conservation	Implement Water Conservation Awareness Programs such as pamphlets	Drought	City/Village/NRD
	3.1.6	Improve Communication	Improve communications to residents and businesses during and following emergencies	All hazards	City/Village/ Emergency Management
	3.1.7	Hazard Education	Increase public awareness of vulnerability and risk reduction measures through hazard education	All hazards	City/Village/County
	3.1.8	First Aid Training	Promote first aid training for all residents	All hazards	Fire/Rescue
	3.1.9	NOAA Radios	Promote public awareness; provide NOAA radios to business area and develop downtown shelter/evacuation plan	All hazards	City/Village
	3.1.10	Hazard Education	Purchase overhead projector and laptop to assist with hazard education	All hazards	Emergency Management
	3.1.11	Train Personnel	Train Personnel for Emergency Response	All hazards	City/Village
Goal 4 Objective 4.1	**4.1.1**	Back-up emergency system	Develop backup systems for emergency vehicles	All hazards	City/Village
	4.1.2	Emergency Response	Have a chain of command in place to carry out efficient emergency response	All hazards	Emergency Management
	4.1.3	Storm Shelter Identification	Identify any existing private or public storm shelters	All hazards	Emergency Management
	4.1.4	Storm Shelters	Identify, design and develop storm shelters to protect communities and CFs	All hazards	Emergency Management
	4.1.5	Tornado Safety	Implement a tornado safety program	Tornados	Emergency Management
	4.1.6	ATV Rescue	Obtain ATV's to assist with search and rescue	All hazards	County
	4.1.7	Rescue Floats	Obtain motor boats for moving around town and rescue floats, etc.	Flooding	City/Village
	4.1.8	Emergency Vehicles	Purchase emergency vehicles	All hazards	County
Goal 4 Objective 4.2	**4.2.1**	Evacuation Plan	Develop an evacuation plan for all CFs and for the city as a whole	All hazards	City/Village
Goal 4 Objective 4.3	**4.3.1**	Back-up Municipal Communication System	Acquire and establish a communications system to coordinate municipal operations during any disaster that disables phone and cell services	All hazards	County
	4.3.2	Alert and Warning System	Alert and warning system including outdoor warning sirens for communities who do not have them within the county	All hazards	EM
	4.3.3	Warning Sirens	Install additional warning sirens	All hazards	City/Village
	4.3.4	Cable Warning System	Obtain a cable interruption warning system	All hazards	City/Village
	4.3.5	Weather Radios	Purchase and issue weather radios for schools and CFs	All hazards	City/Village
	4.3.6	Reverse 911	Reverse 911 system for notification of county residents and businesses	All hazards	Emergency Management
	4.3.7	Cell Phone Tower	Install cell phone tower to improve communications	All hazards	SID

Goal/ Objective	Action Item #	Action Item	Summary	Hazards Addressed	Responsible Department/Agency
Goal 5 Objective 5.1	**5.1.1**	Floodplain Regulation	Continue floodplain regulations to maintain good standing with the NFIP	Flooding	City/Village
	5.1.2	Higher Codes and Standards	Promote the use of higher codes and standards, such as the Fortified for Safer Living Standard, in order to provide greater protection for any new construction or building retrofits	All hazards	City/Building
	5.1.3	Emergency Shelter	Use the Fire Department as an emergency shelter	All hazards	City/Village

Table 59: Mitigation Alternatives selected by each community

Goal/ Objective	Action Item #	Action Item	Ashland	Avoca	Bennet	Brainard	Cass County	Cass County RWD #1	Cass County RWD #2	Cass county SID #1	Cass County SID #5	Cedar Creek	Ceresco	Conestoga Public	Davey	Denton	Eagle	Elmwood	Firth	Greenwood
Goal 2 Objective 2.1	**2.1.1**	Relocate Municipal Infrastructure			X															
	2.1.2	City Well Back-up	X																	
	2.1.3	Central Emergency Shelter															X			
	2.1.4	Bury Utility Lines				X						X			X	X				X
	2.1.5	New Well							X								X			
	2.1.6	Safe Rooms												X						
	2.1.7	Promote Infiltration																		
	2.1.8	Drainage Ditches																		X
	2.1.9	Chemical Incident Sheltering	X		X		X					X	X	X			X	X	X	X
	2.1.10	Safe Rooms										X		X		X				
	2.1.11	Protection of Vulnerable Populations	X		X		X					X	X					X	X	X
	2.1.12	Fuel Tank Anchoring										X								

Goal/ Objective	Action Item #	Action Item	Ashland	Avoca	Bennet	Brainard	Cass County	Cass County RWD #1	Cass County RWD #2	Cass county SID #1	Cass County SID #5	Cedar Creek	Ceresco	Conestoga Public	Davey	Denton	Eagle	Elmwood	Firth	Greenwood
	2.1.13	Relocation of Hazardous Storage			X															
	2.1.14	Facility Floodproofing																		
	2.1.15	Levees and Floodwalls								X		X								
	2.1.16	Improve Drainage		X						X	X	X						X	X	
	2.1.17	High-Risk Properties	X		X		X					X	X			X				X
	2.1.18	Improve Drainage	X		X	X	X						X		X	X	X			X
	2.1.19	Well Improvement																		
	2.1.20	Emergency Generator																		
	2.1.21	Vehicular Barriers	X		X		X					X	X	X			X	X	X	X
	2.1.22	Bank Stabilization										X								
	2.1.23	Preserve Floodplain	X	X	X		X					X	X					X	X	X
	2.1.24	Protect Water Treatment																		
	2.1.25	Back-up Power	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X
	2.1.26	New Chipper															X			
	2.1.27	Snowplow			X															
	2.1.28	Back-up Generator																		
	2.1.29	Back-Up Power																		
	2.1.30	Tree Inventory																		
	2.1.31	Emergency Operations																		

Goal/ Objective	Action Item #	Action Item	Ashland	Avoca	Bennet	Brainard	Cass County	Cass County RWD #1	Cass County RWD #2	Cass county SID #1	Cass County SID #5	Cedar Creek	Ceresco	Conestoga Public	Davey	Denton	Eagle	Elmwood	Firth	Greenwood
	2.1.32	Storm Water Management																		
	2.1.33	Vulnerable Population Database	X	X	X		X					X	X				X	X	X	X
	2.1.34	Channel Improvements								X										
	2.1.35	Stormwater Detention																		
Goal 2 Objective 2.2	**2.2.1**	Municipal Wells											X							
	2.2.2	No Adverse Impact	X	X	X		X					X	X					X	X	X
	2.2.3	Continuity Plan	X	X	X		X		X	X		X	X					X	X	X
	2.2.4	Services in Flooding Events	X		X															
	2.2.5	Hail Resistant Roofing	X	X	X		X					X	X					X	X	X
	2.2.6	Water Supply			X				X											
	2.2.7	Alternate Water System										X								
	2.2.8	Hazardous Spill			X															
	2.2.9	Flooding Master Plan	X		X		X					X	X			X				X
	2.2.10	GPS System			X															
	2.2.11	Conservation Plan																		
Goal 2 Objective 2.3	**2.3.1**	Low Impact Development	X		X		X					X						X	X	X
	2.3.2	Tree City USA					X													
	2.3.3	Community Ratings System	X	X	X		X					X	X			X		X	X	X
	2.3.4	Tree Planting								X	X									

Goal/ Objective	Action Item #	Action Item	Ashland	Avoca	Bennet	Brainard	Cass County	Cass County RWD #1	Cass County RWD #2	Cass county SID #1	Cass County SID #5	Cedar Creek	Ceresco	Conestoga Public	Davey	Denton	Eagle	Elmwood	Firth	Greenwood
	2.3.5	Tree City USA	X																	
	2.3.6	Conservation guidelines							X											
	2.3.7	Tree City USA																		
	2.3.8	NFIP	X		X	X	X						X			X		X	X	X
	2.3.9	Tree City USA		X	X	X						X	X		X	X	X	X	X	X
	2.3.10	Back-up Municipal Records			X															
	2.3.11	FIRMS																		
Goal 3 Objective 3.1	**3.1.1**	Public Information																		
	3.1.2	Business Continuity Planning	X	X	X		X					X					X	X	X	X
	3.1.3	Tree Assistance			X								X							
	3.1.4	Green Mitigation	X	X	X		X	X	X	X	X	X	X				X	X	X	X
	3.1.5	Water Conservation	X		X		X	X	X				X							X
	3.1.6	Improve Communicatio n												X						
	3.1.7	Hazard Education	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	3.1.8	First Aid Training	X	X	X		X					X	X					X	X	X
	3.1.9	NOAA Radios		X	X				X	X	X	X	X			X				
	3.1.10	Hazard Education			X															
	3.1.11	Train Personnel												X			X			
Goal 4 Objective 4.1	**4.1.1**	Back-up emergency system	X		X															
	4.1.2	Emergency Response											X				X			

Goal/ Objective	Action Item #	Action Item	Ashland	Avoca	Bennet	Brainard	Cass County	Cass County RWD #1	Cass County RWD #2	Cass county SID #1	Cass County SID #5	Cedar Creek	Ceresco	Conestoga Public	Davey	Denton	Eagle	Elmwood	Firth	Greenwood
	4.1.3	Storm Shelter Identification																		
	4.1.4	Storm Shelters	X	X	X	X	X			X	X	X	X	X				X	X	X
	4.1.5	Tornado Safety																		X
	4.1.6	ATV Rescue							X											
	4.1.7	Rescue Floats																		
	4.1.8	Emergency Vehicles															X			
Goal 4 Objective 4.2	**4.2.1**	Evacuation Plan	X	X	X	X	X					X	X				X	X	X	X
Goal 4 Objective 4.3	**4.3.1**	Back-up Municipal Communicatio n System			X															
	4.3.2	Alert and Warning System					X													
	4.3.3	Warning Sirens	X							X	X	X								
	4.3.4	Cable Warning System																		
	4.3.5	Weather Radios	X		X		X										X	X	X	X
	4.3.6	Reverse 911					X													
	4.3.7	Cell phone Tower								X										
Goal 5 Objective 5.1	**5.1.1**	Floodplain Regulation		X								X								
	5.1.2	Higher Codes and Standards	X	X	X		X	X				X	X					X	X	X

Goal/ Objective	Action Item #	Action Item	Hallam	Hickman	Lancaster Co	Lincoln	Louisville	Malcolm	Manley	Murdock	Murray	Panama	Plattsmouth	Roca	South Bend	Union	Valparaiso	Waverly	Weeping Water	Weeping Water
Goal 2 Objective 2.1	**2.1.1**	Relocate Municipal Infrastructure																		
	2.1.2	City Well Back-up																		
	2.1.3	Central Emergency Shelter																		
	2.1.4	Bury Utility Lines	**X**																	
	2.1.5	New Well																		
	2.1.6	Safe Rooms											X							X
	2.1.7	Promote Infiltration																X		
	2.1.8	Drainage Ditches																		
	2.1.9	Chemical Incident Sheltering	X	X	X		X			X	X		X			X	X	X	X	X
	2.1.10	Safe Rooms																		X
	2.1.11	Protection of Vulnerable Populations	X	X	X		X			X	X		X			X	X	X	X	
	2.1.12	Fuel Tank Anchoring	X																	
	2.1.13	Relocation of Hazardous Storage																		
	2.1.14	Facility Floodproofing											X					X		
	2.1.15	Levees and Floodwalls																		
	2.1.16	Improve Drainage				X			X	X	X			X		X			X	
	2.1.17	High-Risk Properties		X	X	X	X						X				X	X		
	2.1.18	Improve Drainage	X	X	X	X	X					X	X		X		X	X		
	2.1.19	Well Improvement	X																	
	2.1.20	Emergency Generator											X							
	2.1.21	Vehicular Barriers	X	X	X		X		X	X	X		X			X	X	X	X	X
	2.1.22	Bank Stabilization																		

Goal/ Objective	Action Item #	Action Item	Hallam	Hickman	Lancaster Co	Lincoln	Louisville	Malcolm	Manley	Murdock	Murray	Panama	Plattsmouth	Roca	South Bend	Union	Valparaiso	Waverly	Weeping Water	Weeping Water
	2.1.23	Preserve Floodplain	X	X	X	X	X			X	X		X			X	X	X	X	
	2.1.24	Protect Water Treatment					X													
	2.1.25	Back-up Power	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	
	2.1.26	New Chipper																		
	2.1.27	Snowplow		X		X														
	2.1.28	Back-up Generator	X									X								
	2.1.29	Back-Up Power															X			
	2.1.30	Tree Inventory																X		
	2.1.31	Emergency Operations			X	X														
	2.1.32	Storm Water Management											X							
	2.1.33	Vulnerable Population Database	X	X	X					X	X	X	X			X	X	X	X	
	2.1.34	Channel Improvements				X														
	2.1.35	Stormwater Detention				X														
Goal 2 Objective 2.2	**2.2.1**	Municipal Wells		X																
	2.2.2	No Adverse Impact	X	X	X	X	X			X	X		X			X	X	X	X	
	2.2.3	Continuity Plan	X	X	X	X	X	X		X	X		X			X	X	X	X	
	2.2.4	Services in Flooding Events					X													
	2.2.5	Hail Resistant Roofing	X	X	X	X	X	X		X	X		X			X	X	X	X	
	2.2.6	Water Supply																		
	2.2.7	Alternate Water System											X							
	2.2.8	Hazardous Spill																		

Goal/ Objective	Action Item #	Action Item	Hallam	Hickman	Lancaster Co	Lincoln	Louisville	Malcolm	Manley	Murdock	Murray	Panama	Plattsmouth	Roca	South Bend	Union	Valparaiso	Waverly	Weeping Water	Weeping Water
	2.2.9	Flooding Master Plan			X	X	X						X				X	X		
	2.2.10	GPS System																		
	2.2.11	Conservation Plan	X																	
Goal 2 Objective 2.3	**2.3.1**	Low Impact Development	X	X	X	X	X	X	X	X						X	X	X	X	
	2.3.2	Tree City USA			X															
	2.3.3	Community Ratings System	X	X	X	X	X			X	X	X	X			X	X	X	X	
	2.3.4	Tree Planting		X																
	2.3.5	Tree City USA				X														
	2.3.6	Conservation guidelines	X																	
	2.3.7	Tree City USA		X																
	2.3.8	NFIP	X		X	X	X			X	X	X	X		X	X	X	X	X	
	2.3.9	Tree City USA	X				X		X	X	X	X	X	X	X	X	X	X	X	
	2.3.10	Back-up Municipal Records																		
	2.3.11	FIRMS											X							
Goal 3 Objective 3.1	**3.1.1**	Public Information	X																	
	3.1.2	Business Continuity Planning	X	X	X		X	X		X	X	X	X			X	X	X	X	
	3.1.3	Tree Assistance																		
Goal 3 Objective 3.1	**3.1.4**	Green Mitigation	X	X	X	X	X		X	X	X		X			X	X	X	X	
	3.1.5	Water Conservation		X	X															
	3.1.6	Improve Communicatio n		X								X								X
	3.1.7	Hazard Education	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
	3.1.8	First Aid Training	X	X	X		X		X	X	X		X			X	X	X	X	
	3.1.9	NOAA Radios						X	X			X		X						
	3.1.10	Hazard Education																		

Goal/ Objective	Action Item #	Action Item	Hallam	Hickman	Lancaster Co	Lincoln	Louisville	Malcolm	Manley	Murdock	Murray	Panama	Plattsmouth	Roca	South Bend	Union	Valparaiso	Waverly	Weeping Water	Weeping Water
	3.1.11	Train Personnel																		X
Goal 4 Objective 4.1	**4.1.1**	Back-up emergency system																		
	4.1.2	Emergency Response				X	X													
	4.1.3	Storm Shelter Identification	X																	
	4.1.4	Storm Shelters	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X
	4.1.5	Tornado Safety																		
	4.1.6	ATV Rescue	X			X														
	4.1.7	Rescue Floats															X			
	4.1.8	Emergency Vehicles																		
Goal 4 Objective 4.2	**4.2.1**	Evacuation Plan	X	X	X		X	X		X	X	X	X	X		X	X	X	X	
Goal 4 Objective 4.3	**4.3.1**	Back-up Municipal Communicatio n System																		
	4.3.2	Alert and Warning System			X															
	4.3.3	Warning Sirens				X														
	4.3.4	Cable Warning System	X																	
	4.3.5	Weather Radios	X	X	X		X			X	X		X			X	X	X	X	
	4.3.6	Reverse 911			X															
	4.3.7	Cell phone Tower																		
Goal 5 Objective 5.1	**5.1.1**	Floodplain Regulation		X																
	5.1.2	Higher Codes and Standards	X	X	X	X	X	X		X	X	X	X			X	X	X	X	

Completed Mitigation Efforts

Previously completed mitigation actions are identified per community in their specific participant sections.

Section Six: Plan Implementation and Maintenance

Summary of Changes

Section Six is consistent with what was outlined in the previous mitigation plan. It should be noted that the planning team and participating jurisdictions have designed a tool to meet the annual review requirement for this planning process.

> ***Requirement §201.6(c)(4)(i)**: [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*
>
> ***Requirement §201.6(c)(4)(ii)**: [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*
>
> ***Requirement §201.6(c)(4)(iii)**: [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.*

Monitoring, Evaluating, and Updating the Plan

Participants of the LPSNRD Plan will be responsible for monitoring (annually), evaluating, and updating of the plan. Hazard mitigation projects will be prioritized by each participant's governing body with support and suggestions from the public, as well as property and business owners. Unless otherwise specified by each participant's governing body, the City Council will be responsible for implementation of the recommended projects. The responsible party for the various implementation actions will report on the status of all projects and include which implementation processes worked well, any difficulties they encountered, how coordination efforts are proceeding, and which strategies could be revised.

To assist with monitoring of the plan, as each recommended project is completed, a detailed timeline of how that project was completed will be written and attached to the plan in a format selected by the governing body. Information that should be included will address project timelines, agencies involved, area(s) benefited, total funding (if complete), etc. At the discretion of each governing body, a local task force may be used to review the original draft of the mitigation plan and to recommend changes.

Review and updating of this plan will occur at least every five years. At the discretion of each governing body, updates may be incorporated more frequently, especially in the event of a major hazard. The governing body shall start meeting to discuss mitigation updates at least six months prior to the deadline for completing the plan review. The persons overseeing the evaluation process will review the goals and objectives of the previous plan and evaluate them to determine whether they are still pertinent and current. Among other questions, they may want to consider the following:

- Do the goals and objectives address current and expected conditions?
- If any of the recommended projects have been completed, did they have the desired impact on the goal for which they were identified? If not, what was the reason it was not successful (lack of funds/resources, lack of political/popular support, underestimation of the amount of time needed, etc.)?
- Have the nature, magnitude, and/or type of risks changed?
- Are there implementation problems?
- Are current resources appropriate to implement the plan?
- Were the outcomes as expected?
- Did the plan partners participate as originally planned?
- Are there other agencies which should be included in the revision process?

Worksheets in *Appendix D* may also be used to assist with plan updates.

If major new, innovative mitigation strategies arise that could impact the planning area or elements of this plan, which are determined to be of importance, a plan amendment may be proposed and considered separate from

the annual review and other proposed plan amendments. LPSNRD should compile a list of proposed amendments received annually and prepare a report providing applicable information for each proposal, and recommend action on the proposed amendments.

Continued Public Involvement

To ensure continued plan support and input from the public as well as property and business owners, public involvement should remain a top priority for each participant. Notices for public meetings involving discussion of or action on mitigation updates should be published and posted in the following locations a minimum of two weeks in advance:

- Public spaces/buildings throughout each participating community
- Web sites, local newspapers, and regionally-distributed newspapers

Incorporation into Existing Planning Mechanisms

THE USE OF THE SAFE GROWTH AUDIT

> "As Communities grow and develop, they may become more vulnerable to natural hazards."
>
> - *Safe Growth Audit by David R. Godschalk, FAICP*

Expanding into more hazardous areas or redeveloping existing areas already subject to hazards can expose communities to unnecessary risks. In order to avoid making unwise development or redevelopment decisions and in order to enhance communities' overall resilience to (natural and man-made) hazards, the Practice Safe Growth Audit, development by APA, was utilized in the update of this HMP. The purpose of the safe growth audit is to analyze the impacts of current policies, ordinances, and plans on community safety from hazard risks due to growth. It gives the community a comprehensive but concise evaluation of the positive and negative effects of its existing growth guidance framework on future hazard vulnerability and also provides guidance for decision makers about future possible improvements. The Safe Growth Audit was used in this plan by reviewing the comprehensive plan of each community that made it available. A survey was also asked of each community to gauge their capabilities. Many of the comprehensive plans were very old and some communities did not provide a plan at all.

The major principals for this safe growth audit are to:

- Create a safe growth vision.
- Guide growth away from high risk locations.
- Locate CFs outside high-risk zones.
- Preserve protective ecosystems.
- Retrofit building and facilities at risk in redeveloping areas.
- Develop knowledgeable community leaders and networks.
- Monitor and update safe growth programs and plans.

In addition to ensuring that the goals and objective of this plan are incorporated into revisions of each participant's planning mechanism, local governing bodies will be responsible for integrating the safe growth audit findings and recommendations into future planning improvements. One way to incorporate the findings of the audit into future planning improvements is to invite a member of the planning team to be involved with future updates of comprehensive plans. Please go to *Section Seven: Participant Sections* for detailed information regarding each community.

Section Seven: Participant Sections

Summary of Changes

Like the previous plan, participant sections provide greater information regarding the local jurisdictions. In this update, we have incorporated some additional risk assessment analysis and updated CFs maps.

Purpose of Participant Sections

Participant sections contain information specific to jurisdictions which have participated in the planning effort. Information from individual communities was collected at public meetings and used to develop the plan. Participant sections include background information such as history and development, location, geography, climate, demographics, and listing of jurisdiction specific documents used to establish the plan. In addition maps specific only to single jurisdictions are included such as: structural inventory, CFs, and 1% floodplain boundaries.

Please note that depending on which hazards were identified by the jurisdiction and the information that was available at the time of the plan, not all participating jurisdictions will have the same information. For example, jurisdictions that do not have a 1% annual floodplain or have not had a map delineated will not have a floodplain map in their respective sections. Below is a summary of the maps which may be included in the participant sections. Each map may not be referenced specifically in the sections.

- CF and Flooding Hazard Area Map – displays the locations of CFs as identified by the participants. Refer to *Section Three: Profile* for the definition of and displays the 1% annual floodplain as well as any structures located within the delineated boundary.

The risk assessment information, as provided by individual participants, in *Section Four: Risk Assessment* and *this section* varies due in large part to the extent of the geographical area and the jurisdictions designated representatives (who were responsible for completing meeting worksheets) personal opinion on the identification of hazards and presence and risk of each hazard type. For example, a jurisdiction located near a river may list flooding as highly likely in probability and severe in extent of damage, where a jurisdiction located on a hill may list flooding as unlikely in probability and limited in extent of damage. Or, one jurisdiction's designated representative may have concerns regarding tornados and list highly likely in probability and catastrophic in extent of damage, in comparison to another jurisdiction's representative may believe a tornado will never hit the town and list unlikely in probability and limited in extent of damage.

The overall risk assessment for the identified hazards represents the vulnerability to each hazard throughout the planning area. The individual participant hazard identification tables and responses may or may not reflect the consensus for risk and vulnerability to each hazard type in the area.

Participant Section for LPSNRD

LPSNRD
Multi-Jurisdictional Hazard Mitigation Plan

March 2015

District Profile

HISTORY

Nebraska's Natural Resources Districts were created by the Nebraska Legislature and began serving the people of the state in 1972. The legislature combined 154 special purpose resources management entities, including county soil and water conservation districts, drainage districts, and watershed boards into 24 NRDs. In 1989, this number was reduced to 23 NRDs through a merger of the Papio NRD and the Middle Missouri Tributaries NRD. These districts are unique to Nebraska. No other state has a system for managing its natural resources identical to Nebraska's NRDs. The LPSNRD is governed locally by a Board of 21 elected directors.

The LPSNRD uses property tax dollars to accomplish a range of projects and programs for the benefit of the people and the resources of the District. Examples of current projects include; the MoPac east trail extension, dam rehabilitations, flood control, the Antelope Valley Project, stream stabilization, the Platte River Obstruction Removal project, and more. These projects range from actions to improve safety and the environment, to creating, improving, and maintaining public recreational outlets.

The LPSNRD owns and maintains eight public access lakes, saline wetlands and three recreational trails. Saline wetlands are classified as such by the levels of salinity found in the soil. The saline wetlands are one of the earth's most rare ecosystems; only 4,000 acres of the estimated 20,000 that originally existed, exist today. The LPSNRD's wetlands are home to two endangered species, thus it is especially important to make thorough efforts to conserve them.

LPSNRD's Master Plan Objectives focuses on eight areas that are indicative of what the NRD strives to accomplish:

- **Sustainable Water Resources –** The ability to predict changes in groundwater quality and quantity. Ground water levels are maintained and quality standards are exceeded or met for all domestic water users.
- **Low Impact Development** – All developments are compatible with and also conserve natural resources
- **Minimal Flood Threat and Damage** – Flood damages are reduced or eliminated and the public safety risk from flooding is minimized
- **Protected Natural and Unique Resource Areas** – All remaining natural and unique resource areas are identified, assessed, and sustained, or enhanced
- **Ample Natural-Resource Based Recreation** – The NRD provides diverse, safe, outdoor recreation opportunities across the district.
- **Properly Managed Agricultural Lands** – Owners of all agricultural lands utilize best management practices for water quality and quantity, maintain soils at sustainable levels in accordance with their capabilities and conserve energy
- **Healthy Forests** – The forestry resources of the NRD are diversified and enhanced in urban area. Rural forests are preserved and expanded
- **People are Responsible Conservationists** – The NRD is a credible source of information on natural resources for the public and other agencies and works with schools on providing natural resources education
- **Health Wildlife Populations** – Diverse, dispersed, and healthy wildlife populations thrive throughout the NRD
- **Stable Climate and Clean Environment** – Best Management practices for energy and conservation are everyday activities for the residents and businesses of the NRD
- **NRD is a Conservation Leader** – The LPSNRD is at the forefront of the innovative conservation with its projects and programs

LOCATION

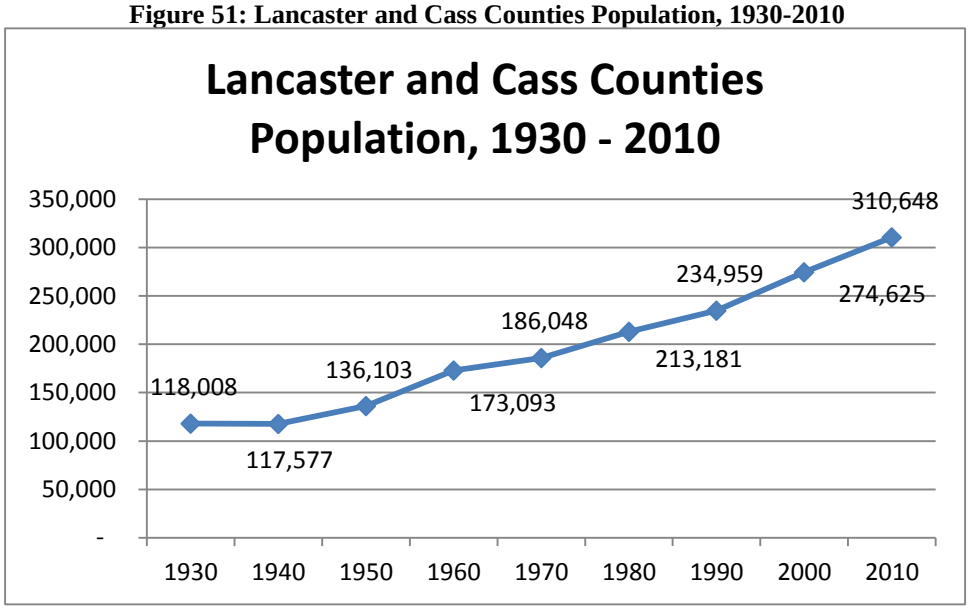
The Lower Platte South Natural Resources District (LPSNRD) is located in southeastern Nebraska and is made up of the majority of Lancaster and Cass Counties as well as portions of Seward, Saunders, Otoe, and Butler Counties. This region lies in a topographic region of 'rolling hills'. Rolling hills are hilly land with moderate to steep slopes and rounded ridge crests. In eastern Nebraska, the rolling hills are mostly glacial till that has been eroded and mantled by loess.

The District consists of the Salt Creek Watershed, the Weeping Water Creek Watershed, and the Northeast Cass Watershed. The Salt Creek Watershed is comprised of a series of sub-basins such as; Antelope Creek, Beal Slough, Cardwell Branch, Deadman's Run, Upper Salt Creek, Rock Creek, Callahan, Dee, Haines Branch, Little Salt Creek, Lynn Creek, Middle Creek, Oak Creek, Southeast Upper Salt Creek, and Stevens Creek basins. The District mostly drains into the Platte River along with the Missouri River to the east. As described by its name, the area is considered the southern portion of the Lower Platte River watershed.

DEMOGRAPHICS

The population of LPSNRD has steadily risen since 1940. The population in 1940 was 120,475. The 2010 population was 314,890. This growth can be contributed to the population growth in Lancaster and Cass Counties. Figure 51 shows the population from 1930 to 2010.

Figure 51: Lancaster and Cass Counties Population, 1930-2010



Source: U.S. Census Bureau, 2010

GOVERNANCE

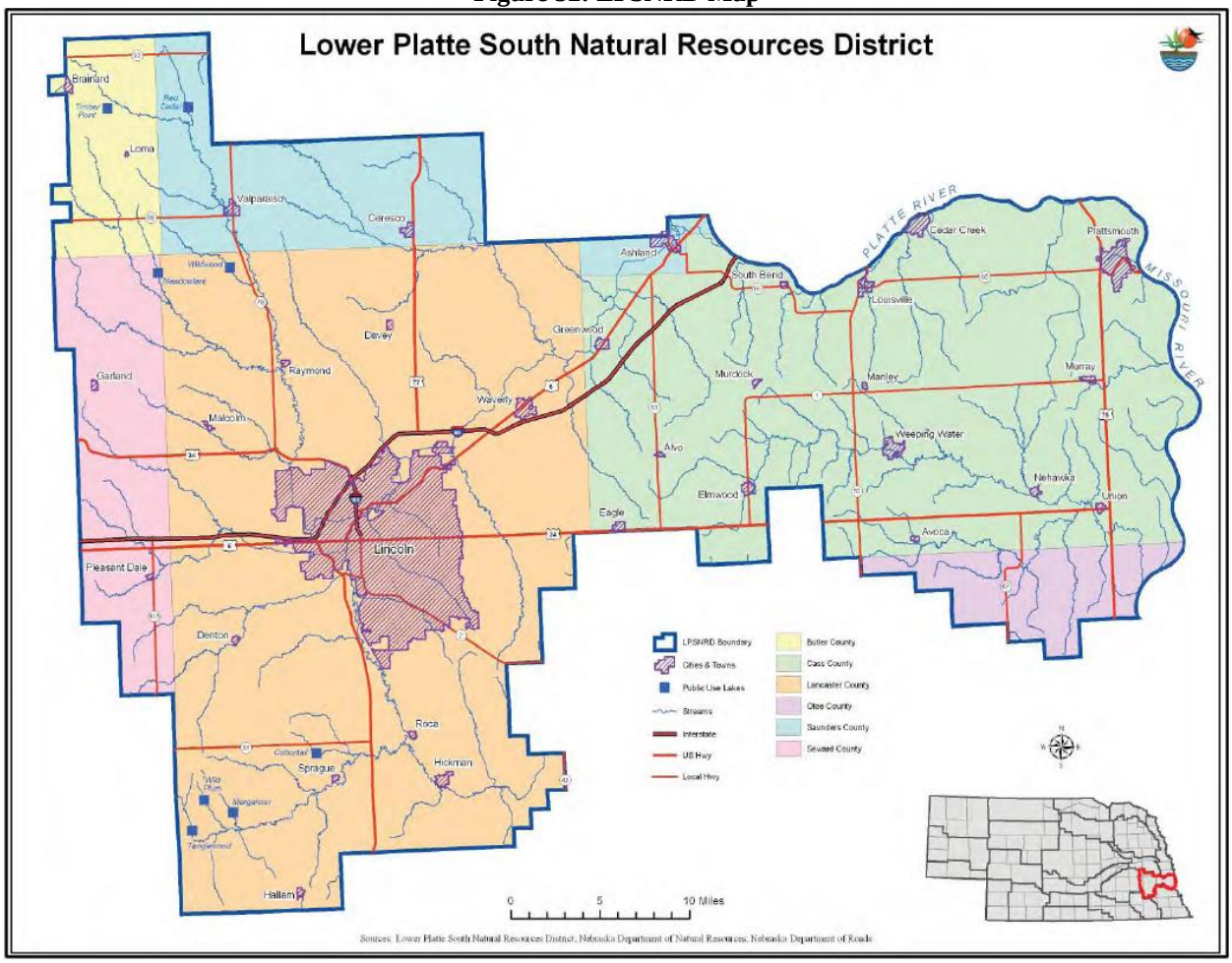
The LPSNRD office is located in Lincoln. The NRD has a board of directors with 21 members and includes the following subcommittees:

- Land Resources
- Water Resources
- Urban
- Recreation, Forestry and Wildlife
- Executive
- Finance & Planning
- Information and Education
- Antelope Valley
- Platte River
- Integrated Management

FUTURE DEVELOPMENT TRENDS

The district boundaries of LPSNRD are in an area currently experiencing 'widespread' development, mostly due to Lincoln, Waverly, Interstate 80, and areas south of the Platte River in northern Cass County. Due to this development, urbanization of the rural landscape around the District has increased a number of issues the LPSNRD is responsible for such as erosion prevention and control, increased runoff due to a reduction of impervious surfaces, flood prevention and control, and management of drainage ways. See the following Figure 52 for a map of the LPSNRD boundaries and the Communities within. Information on each community's future development can be found in their respective 'participant section'.

Figure 52: LPSNRD Map



Source: LPSNRD Master Plan, 2009

STRUCTURAL INVENTORY AND VALUATION

Results from the structural inventory for LPSNRD are found in Table 60.

Table 60: Structural Inventory for LPSNRD

Structure Type	Number of Structures	Total Value	Value per Structure
Commercial/Industrial	7,920	$5,197,494,004	$656,249
Agricultural	9,010	$1,022,173,653	$113,449
Residential	85,916	$9,703,901,941	$112,946
Public/Quasi Public	48,483	$8,376,430,402	$172,770
Total	**151,329**	$24,300,000,000	

Source: Nebraska Department of Revenue, Property Assessment Division

Of the structures which are located in the unincorporated areas of Cass and Lancaster Counties, the following shown in Table 61 are in the 1% annual floodplain:

Table 61: Structural Inventory - Floodplain

Structure Type	Number of Structures	Total Value
Agricultural	5,315	$1,245,146,299
Commercial	199	$174,001,206
Industrial	349	$144,080,418
Residential	894	$491,486,219
Other	906	$292,669,871
Total	**7,663**	**$2,347,384,013**

Risk Assessment

The following information represents unique characteristics of the hazards of greatest concern for LPSNRD. See *Section Four: Risk Assessment* for the consolidated Risk Assessment table specific to LPSNRD. The five hazards of most concern to the LPSNRD are: severe thunderstorms, severe winter storms, flooding, chemical transportation, and extreme heat.

SEVERE THUNDERSTORMS

The planning team identified severe thunderstorms as the top concern for the planning area and expected that more than four severe thunderstorms would take place in the community in the next decade.

Damages to roofs and siding can result in significant losses for homeowners as well as business owners. CFs can also be damaged by hail events. 103 of the 340 hail events recorded by the NCDC for LPSNRD reported hail of one inch; using the TORRO Hailstone Scale expected impacts form this type of event include damages to trees and crops, broken glass, and damages to plastic outdoor structures. 49 of the hail events reported hail stones of one and three quarter inches or larger; stones of this size can result in wholesale destruction of glass, damage to tiled roofs, and is cause for concern related to the safety of residents as stones of magnitude pose a significant risk to persons and can cause injuries. Two events resulted in more than $1 million in losses. One event occurred on July 18, 1996 in Plattsmouth and caused $1,000,000 in property damage and $250,000 in crop damage. The second event occurred on July 20, 2000 and recorded $2,000,000 in property damage and $1,000,000 in crop damage. There were also 12 lightning events recorded by NCDC that resulted in a total of $1,276,000 of property damages. In addition, 93 thunderstorm events reported a total of $2,049,000 in property damage.

The district has older housing stock and an aging population, both of which may lead to greater levels of vulnerability. Severe thunderstorms and hail can result in loss of electricity, blocked roadways, damages to trees, and flooding. Blocked roadways, as a result of downed threes, may also present life safety concerns to those needing immediate medical attention.

Severe Winter Storms

The county planning team identified severe winter storms as a significant concern for the district. NCDC data records severe winter storms as "zonal" events and there are 88 recoded events. One of the recorded events resulted in a total of $19,175,000 of property damage and $400,000 of crop damage.

The elderly may be more likely to sustain an injury or have a medical emergency as a result of shoveling snow following a winter storm. Community members and families below the poverty line are also as higher risk related to severe winter storms, as they may lack resources needed to sustain themselves through a major severe winter storm.

Flooding

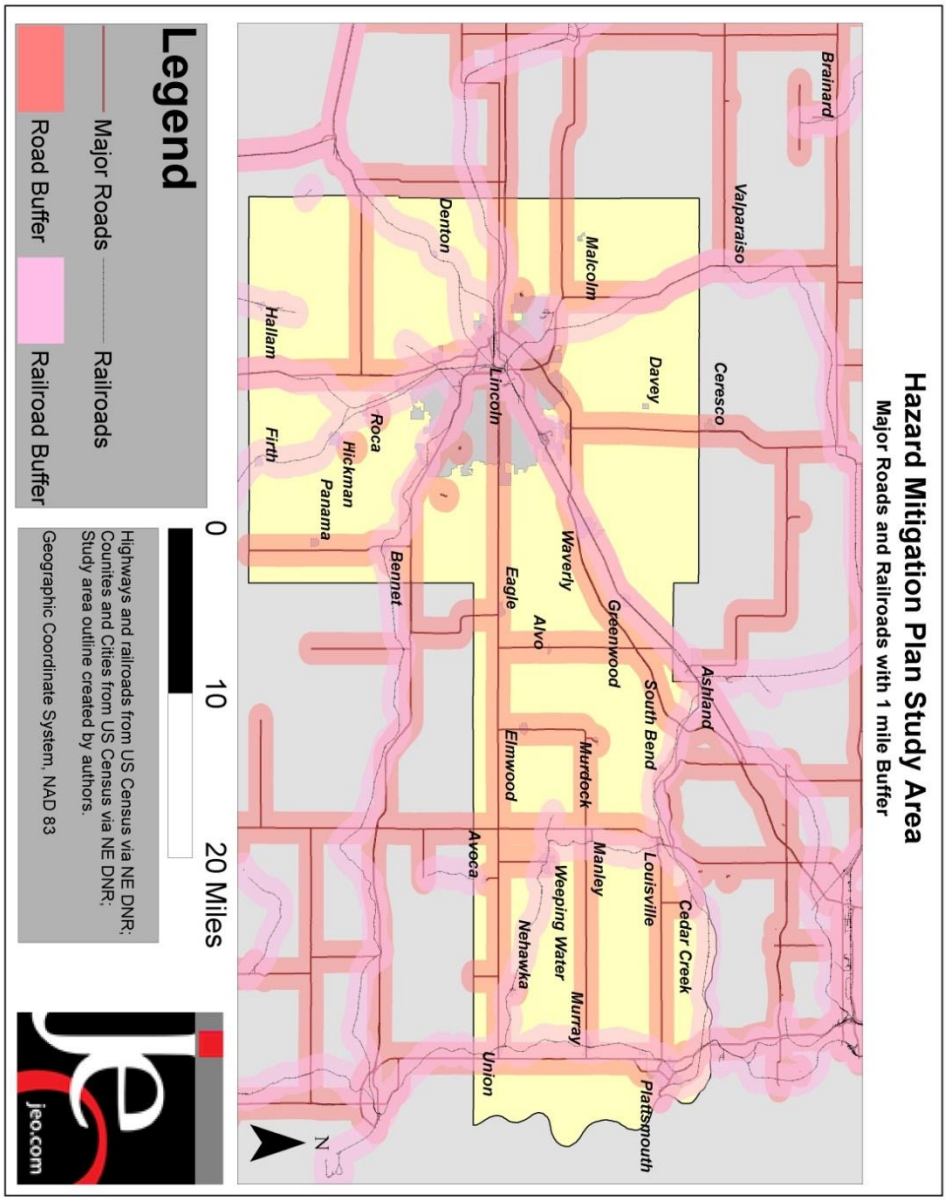
The planning team identified flooding as a significant concern for the district. The NCDC reports 59 flooding events from 1996 to 2013. Of these 59 events 38 are flash flooding and 21 are riverine flooding. According to the NCDC flash flooding resulted in $3,347,000 in property damages and $55,000 in crop damage. Riverine flooding caused $1,830,000 in property damages and no crop damages.

LPSNRD also has repetitive loss properties based on NFIP records. Those properties include 39 single-family properties and 5 non-residential structures.

Chemical Transportation

The planning team identified chemical transportation as a significant concern. According to the Pipeline and Hazardous Material Safety Administration (PHMSA) there have been 11 spills/leaks involving hazardous materials. Additionally, there have been chemical leaks and natural gas leaks and explosions. Figure LPS 3 shows the major transportation routes through LPSNRD.

Figure 53: LPSNRD Major Transportation Routes



EXTREME HEAT

The planning team identified extreme heat as a significant concern for the district. The High Plains Regional Climate Center reports approximately 41 days over 90°F annually. Extreme heat events are most likely to occur during June, July, and August.

Elderly residents, young children, and low-income families are all groups within the community which are more vulnerable to the impacts of extreme heat events. Low-income elderly in urban areas are especially at risk from extreme temperatures.

Capability Assessment

The capability assessment consisted of two main components: a Capability Assessment Survey completed by the jurisdiction and a review of local existing policies, regulations, plans, and programs. The survey is used to gather information regarding the jurisdiction's planning and regulatory capability; administrative and technical capability; fiscal capability; and educational and outreach capability.

Table 62: LPSNRD Capability Assessment

Survey Components/Subcomponents		Comments
Planning & Regulatory Capability	Comprehensive Plan	Yes (2009)
	Capital Improvements Plan	No
	Hazard Mitigation Plan	Yes
	Emergency Operational Plan	Yes
	National Resources Protection Plan	Yes
	Floodplain Management Plan	Yes
	Storm Water Management Plan	No
	Floodplain Ordinance	Yes
	Well Head Protection Area/District	No
	Other (if any)	N/A
Administrative & Technical Capability	Planning Commission	Yes
	Hazard Mitigation Planning Commission	No
	GIS Coordinator	Yes
	Civil Engineering	Yes
	Staff Who Can Assess Community's Vulnerability to Hazards	Yes
	Grant Manager	No
	Other (if any)	N/A
Education & Outreach Capability	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes
	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes
	Public-private partnership initiatives addressing disaster-related issues	Yes
	Other (if any)	N/A

Mitigation Actions

NEW OR PREVIOUSLY IDENTIFIED MITIGATION ACTIONS

The following hazard mitigation actions were identified high by LPSNRD, or were noted as being underway since the previous hazard mitigation plan.

Continue & Expand Water Conservation Awareness Programs, such as pamphlets

Description: Improve a program to conserve water use by the citizens during elongated periods of drought. Potential restrictions on water could include limitations on lawn watering, car washing, or water sold to outside sources. Work with DNR on farm irrigation restrictions.
Hazard(s) Addressed: Drought
Estimated Cost: $1,000 +
Potential Funding: PDM, HMGP, LPSNRD
Timeline: 5 Years
Priority: High
Lead Agency: LPSNRD (public relations), Lincoln Water System, Water Suppliers
Status: Developing education materials

Hazard Education

Description: Increase public awareness of vulnerability and risk reduction measures through hazard education
Hazard(s) Addressed: All hazards
Estimated Cost: $0 - $1,000
Potential Funding: PDM, HMGP, LPSNRD
Timeline: Ongoing
Priority: High
Lead Agency: Cities
Status: In Progress

Master Plan

Description: Maintain NRD Master Plan to prioritize all hazard related projects
Hazard(s) Addressed: All hazards
Estimated Cost: $1,000 - $5,000
Potential Funding: PDM, HMGP, LPSNRD
Timeline: Ongoing
Priority: High
Lead Agency: NRD (Assistant Manager)
Status: In Progress. Master Plan is regularly reviewed and updated.

Emergency Action Plans

Description: Maintain NRD Emergency Action Plans to ensure safety of dams in the NRD
Hazard(s) Addressed: Dam Failure
Estimated Cost: $1,000 +
Potential Funding: PDM, HMGP, LPSNRD
Timeline: Ongoing
Priority: High
Lead Agency: NRD (Assistant Manager)
Status: In Progress. Emergency Action Plans are regularly reviewed and updated.

Incorporate Hazards in Planning Mechanisms

Description: Incorporate known hazards into existing planning mechanisms as appropriate
Hazard(s) Addressed: All hazards
Estimated Cost: $1,000 +
Potential Funding: PDM, HMGP, LPSNRD
Timeline: Ongoing
Priority: High
Lead Agency: Cities
Status: In Progress. Cities incorporate hazards as opportunites are identified.

Preserve Floodplain

Description: Preserve natural and beneficial functions of floodplain land through measures such as: retaining natural vegetation, restoring streambeds; and preserving open space in the floodplain.
Hazard(s) Addressed: Flooding
Estimated Cost: Varies
Potential Funding: PDM, HMGP, LPSNRD
Timeline: Ongoing
Priority: High
Lead Agency: NRD (Assistant Manager)/ Cities, Floodplain Manager
Status: In Progress. NRD regularly supports cities in floodplain preservation projects. No specific projects to report at this time.

Utilize low impact development practices and green infrastructure to reduce flood risk

Description: Low impact development practices and green infrastructure can reduce runoff and result in a reduction in stormwater related flooding
Hazard(s) Addressed: Flooding
Estimated Cost: Varies
Potential Funding: LPSNRD
Timeline: Ongoing
Priority: High
Lead Agency: Cities, Cass County/Lancaster County, LPSNRD, Floodplain Manager
Status: Lands developed in the floodplain by the NRD are typically recreation areas and trails. Developments typically use permeable pavement.

Green Mitigation

Description: Educate the public and business owners regarding rain gardens, green roofs, and other minor mitigation measures.
Hazard(s) Addressed: All Hazards
Estimated Cost: Varies
Potential Funding: LPSNRD
Timeline: 5 Years. Develop educational materials
Priority: High
Lead Agency: LPSNRD (Stormwater Specialist), Cities
Status: Not Yet Started

Hazard Risk Reduction

Description: Continue to work with state agencies such as NDNR to reduce hazard risk
Hazard(s) Addressed: All Hazards
Estimated Cost: Varies
Potential Funding: NDNR, NEMA
Timeline: Ongoing
Priority: High
Lead Agency: Cities, Cass County Emergency Manager/ Lancaster County Emergency Manager, LPSNRD (Stormwater Specialist)
Status: In Progress

Integrated Water Management Plan (IMP)

Description: Maintain and Update Integrated Water Management Plan to ensure sufficient water supply for the future
Hazard(s) Addressed: Drought
Estimated Cost: Varies
Potential Funding: LPSNRD
Timeline: 1 Year
Priority: High
Lead Agency: LPSNRD (General Manager)
Status: In Progress. IMP was adopted in 2014, implementation plan developed in 2015.

Plan Maintenance

Description: Assist jurisdictions with plan maintenance
Hazard(s) Addressed: All hazards
Estimated Cost: Varies
Potential Funding: LPSNRD
Timeline: Ongoing
Priority: Medium
Lead Agency: LPSNRD (Assistant Manager)
Status: In Progress

Install vehicular barriers to protect CFs and key infrastructure where possible

Description: Vehicular barriers can be utilized to prevent accidental, or purposeful, vehicular impacts to CFs and key infrastructure.
Hazard(s) Addressed: Terrorism
Estimated Cost: $5,000 +
Potential Funding: DHS
Timeline: 3 – 5 years
Priority: High
Lead Agency: Cities
Status: In Progress

Backup Power

Description: Provide backup power systems to provide redundant power supply to CFs and key infrastructure
Hazard(s) Addressed: All
Estimated Cost: Varies
Potential Funding: PDM, HMGP, LPSNRD
Timeline: Ongoing
Priority: Medium
Lead Agency: NEMA, Cities
Status: Not Yet Started: No backup generators have been installed to date.

Drought Mitigation Plan

Description: Develop drought mitigation plan to reduce impacts of drought
Hazard(s) Addressed: Drought
Estimated Cost: 25,000
Potential Funding: LPSNRD
Timeline: 2 Years
Priority: High
Lead Agency: LPSNRD
Status: In Progress

Participant Section for Lancaster County

LPSNRD

Multi-Jurisdictional Hazard Mitigation Plan

March 2015

Community Profile

HISTORY

The area of Lancaster County was first used by the Native Americans. It was not until 1856 that the county was inhabited by settlers along the Salt Creek. The settlers were attracted to the saline deposits and attempted to create a small salt trading business. The business ceased when it was realized that the salt extraction process was more complicated than originally thought and there was a short supply.

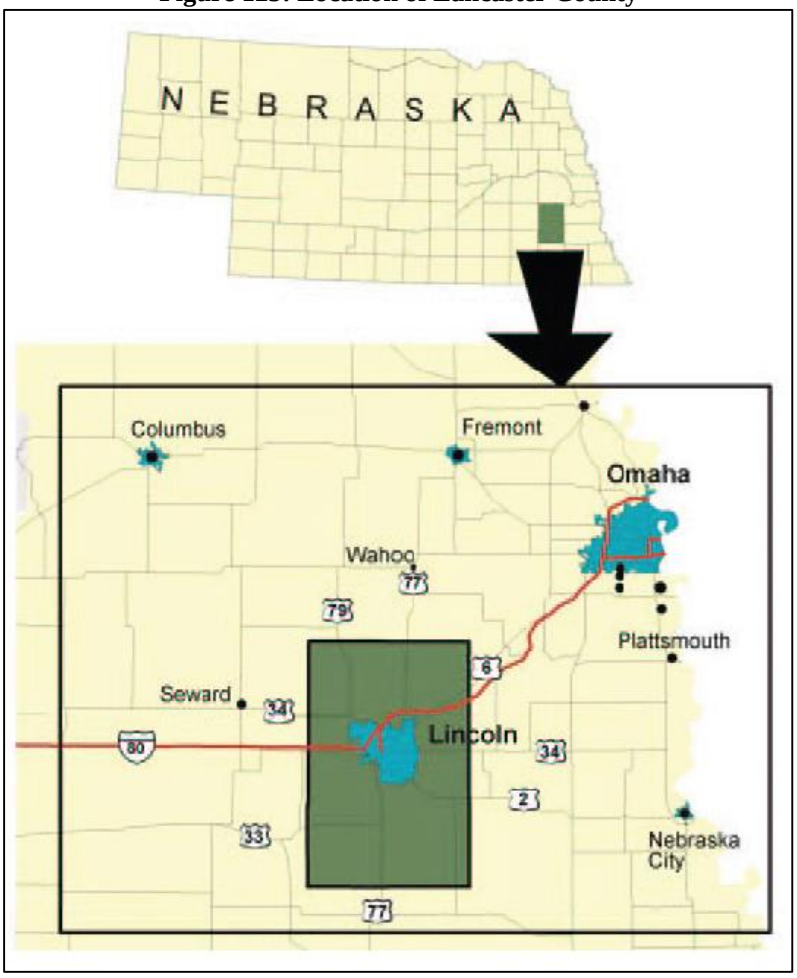
In 1859 Lancaster County was formed in relation to the establishment of the overland trail to the west. It was at this time that the population began to steadily increase.

LOCATION/GEOGRAPHY

Lancaster County

Lancaster County is located in the southeast portion of Nebraska. It is at the eastern edge of the Great Plains area. Within the county there are three physiographic areas: uplands, stream terraces, and bottom lands. The uplands are the largest portion of the area, covering approximately 80 percent of the land. The uplands are comprised of glacial till that is covered with loess. The stream terraces are located predominately along the Salt Creek. The bottom lands are along the major drainage ways.

Figure 123: Location of Lancaster County



Source: Lincoln/Lancaster County Comprehensive Plan

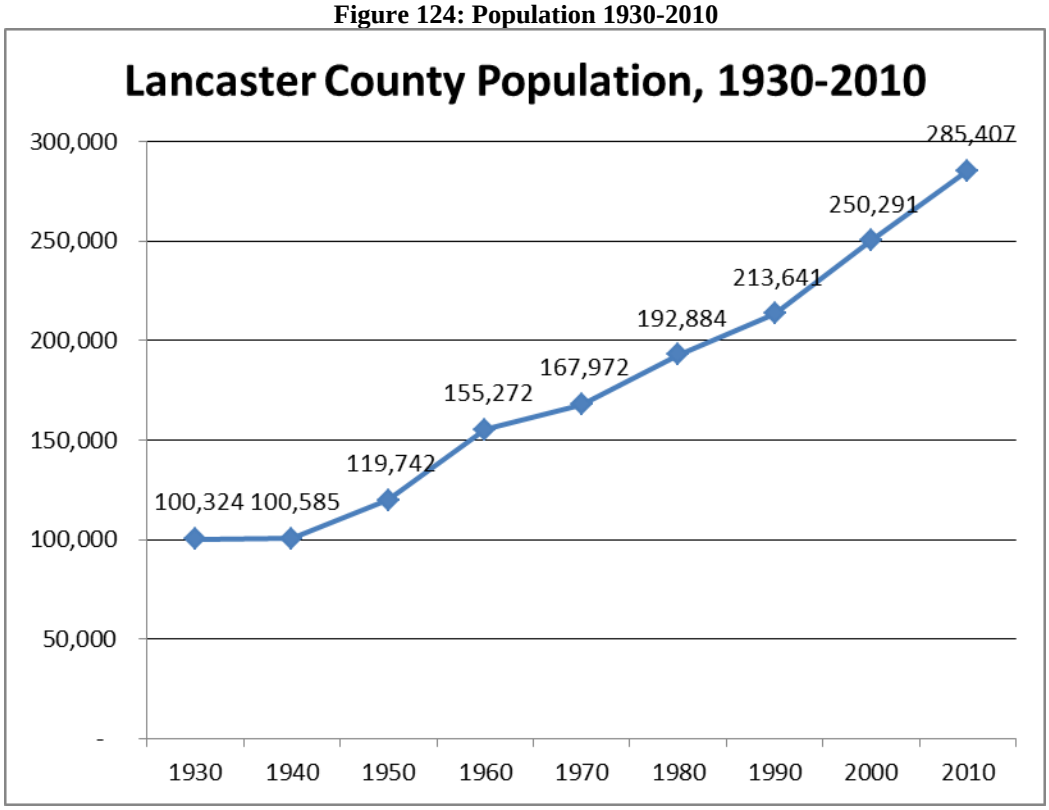
DEMOGRAPHICS

According to the Lincoln/Lancaster County Comprehensive Plan 2040, written in 2011, the county's population is expected to reach over 412,000 persons by the year 2040. By the year 2060, The county's population is projected to reach 512,000 people, or almost 226,000 more people than residence in the county today. In the most recent decade, the county's population gained over 35,000 new residents. This annualized growth rate of 1.3 percent during the 2000's was a slower pace than the average decade over the past 100 years.

The population is primarily located in the City of Lincoln and other incorporated areas, with only around 6 percent of the population located in the unincorporated areas.

As the comprehensive plan indicates, another demographic trend of significance is the continuing growth in the senior population. The number of people in Lancaster County aged 65 and older is projected to increase by about 44,000 to reach about 75,000 in 2040. It represents a projected annual growth rate of 2.96 percent, the highest among all age sectors. The following figure shows the population in the county from 1930 to 2010.

Figure 124: Population 1930-2010



Source: U.S. Census Bureau, 2010

COUNTY GOVERNANCE

Lancaster County includes the following agencies (* indicates an agency which is shared with the City of Lincoln):

- Aging Partners*
- Board of Commissioners
- Budget & Fiscal
- Building & Safety*
- Clerk of the District Court
- County Engineer
- County Sheriff
- County Treasurer
- District Court
- Election Commissioner
- Jury Commissioner
- Juvenile Court
- Lincoln City Libraries*
- Planning*
- Prop. Mgmt. / Public Bld. Comm.
- Purchasing*
- Weed Control Authority
- Youth Services Center
- Community Corrections
- Community Mental Health
- Cooperative Extension
- County Assessor / Reg. of Deeds
- County Attorney
- County Corrections, Jail
- Emergency Management
- General Assistance
- Health*
- Human Resources*
- Human Rights Commission*
- Human Services
- Information Services*
- Public Defender
- Records and Info Management
- Risk Management
- Veterans Service Center

FUTURE DEVELOPMENT TRENDS

Lancaster County, by nature, cannot and will not change its borders and will not experience any future development outside of its borders. Any future development will take place within the County as communities grow.

The vast majority of the county's population is located within the city of Lincoln, with 91.3 percent of Lancaster County's dwelling units in Lincoln in 2000. From the 2011 Lincoln/Lancaster County Comprehensive Plan, it is assumed by 2040 an additional 52,100 dwelling units will be added within the County, with around 16 percent of these built within the existing City.

According to the county comprehensive plan, the growth areas within the county are divided into tiers for their prioritization of future growth. The following map illustrates the 2040 Priority Growth Areas for the county and the map following shows the 2040 Lancaster County Future Land Use Plan. The growth areas are broken up into four general regions: Redevelopment and infill in the existing city, and the Tier I, II, and III growth areas. Such a planned future growth pattern in a timely manner will reduce the possibility of exposing the population to unnecessary risks by developing in unincorporated areas or areas lacking of proper infrastructures and facilities. Please refer to the comprehensive plan for more detailed information regarding future growth within the county. Although all three tiers include some land in the 1% annual floodplain, the plan does state that: "The natural topography and features of the land should be preserved by new development to maintain the natural drainage ways and minimize land disturbance."

Figure 125: Future Development

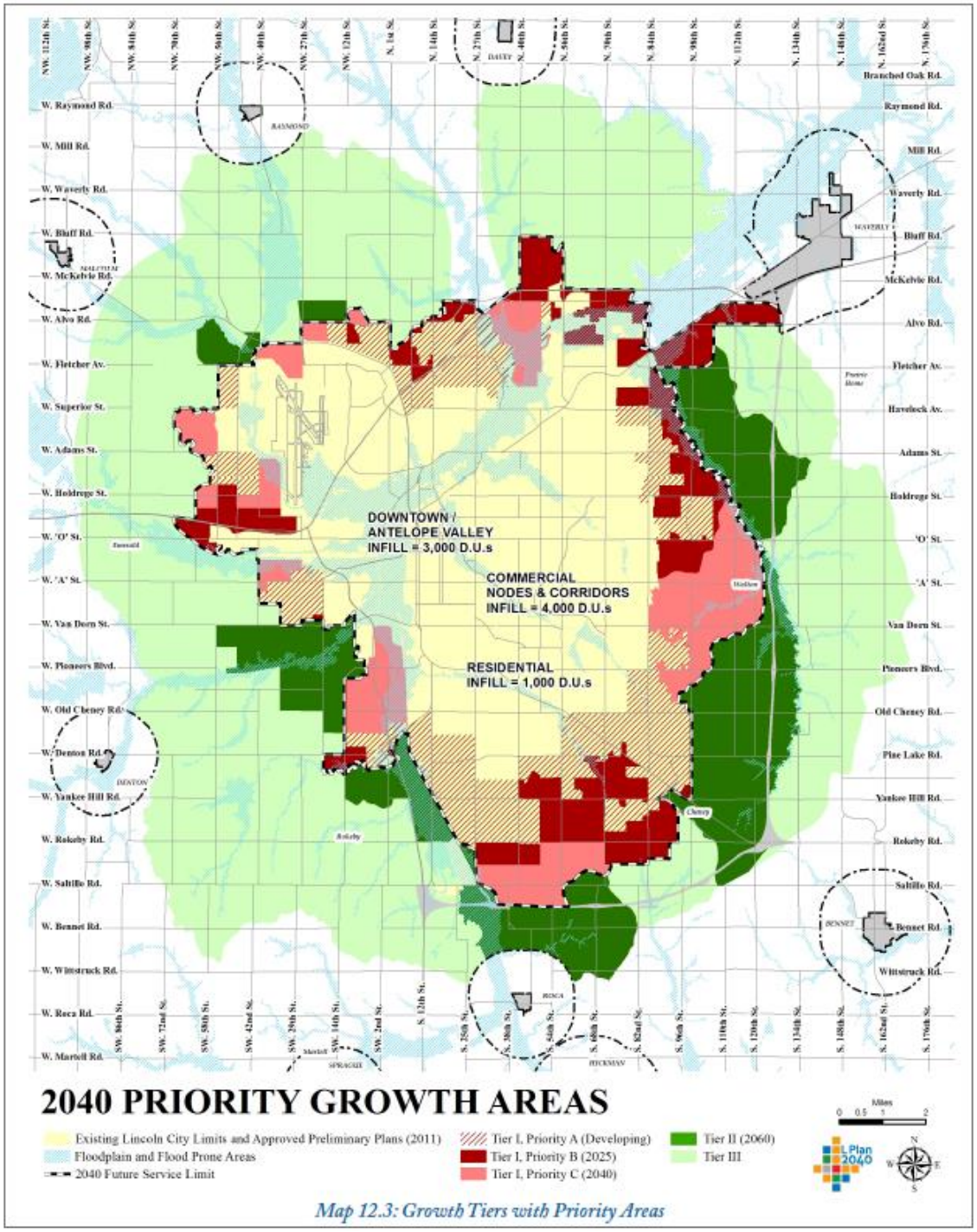
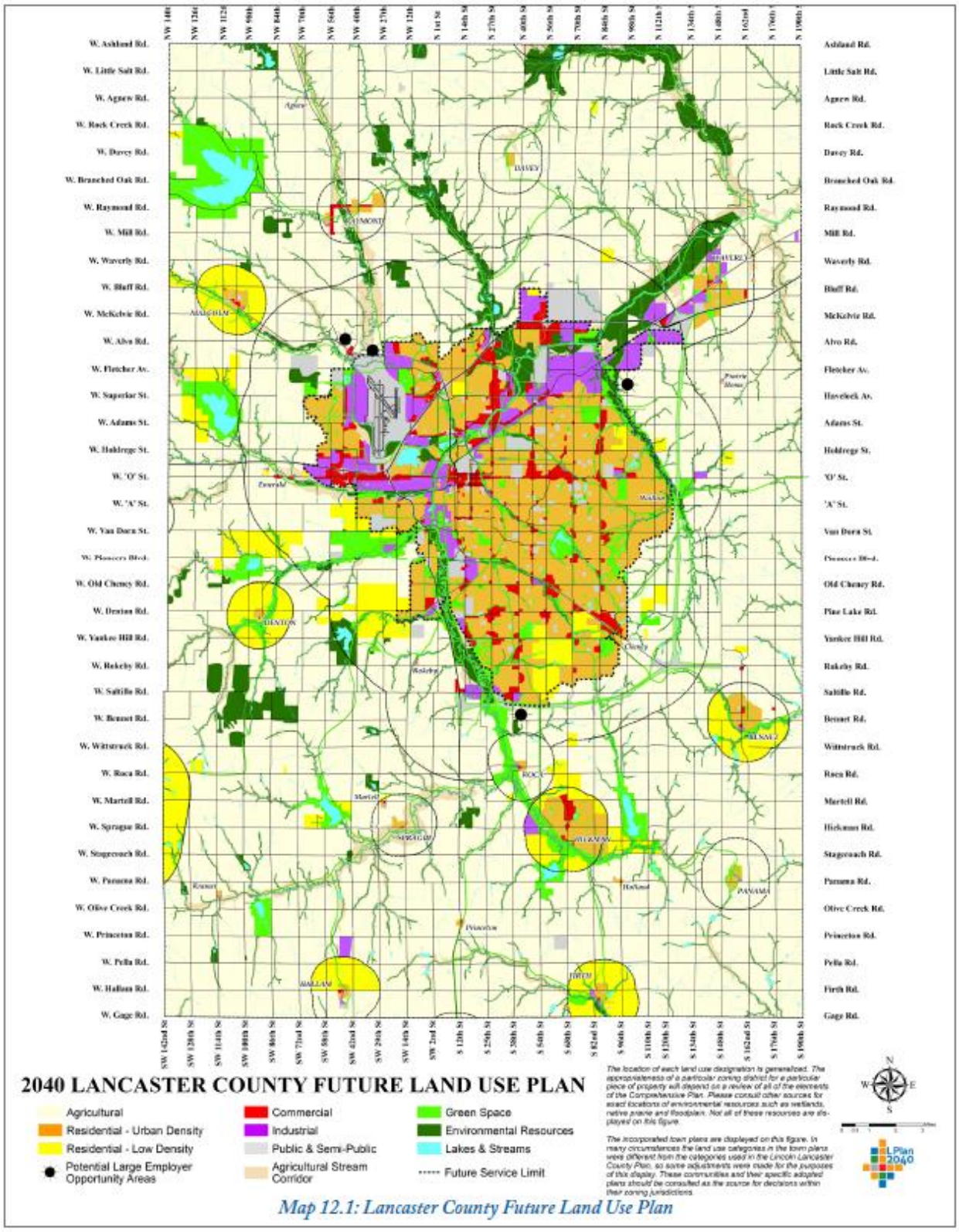


Figure 126: Future Land Use



Map 12.1: Lancaster County Future Land Use Plan

STRUCTURAL INVENTORY AND VALUATION

The total structural inventory for Lancaster County is found in the table below. Information displayed in Table 159 includes the number of structures, value per structure, and total value of each structure type.

Table 159: Structural Inventory

Structure Type	Number of Structures	Total Value	Value per Structure
Commercial/Industrial	6,932	$5,106,610,580	$736,672
Agricultural	7,327	$39,870,300	$5,442
Residential	79,303	$13,598,816,168	$171,479
Other	43,260	$20,434,113	$472
Total	**136,822**	**$18,765,731,161**	**-**

Source: Nebraska Department of Revenue, Property Assessment Division

Of these structures, the following are both located within the 1% annual floodplain and within the unincorporated areas.

Table 160: Structural Inventory - Floodplain

Structure Type	Number of Structures	Total Value
Commercial	171	$125,970,912
Industrial	320	$235,735,040
Agricultural	5,288	$28,671,536
Residential	640	$109,746,560
Other	724	$341,728
Total	**7,135**	**$500,465,776**

Lancaster County has properties listed as repetitive losses based on NFIP. Those properties include one single family property and one non-residential property.

CRITICAL FACILITIES

Critical infrastructure was organized by the relevant Emergency Support Functions (ESF). For each incorporated community, CFs were identified by each community. Refer to each participant section for the locations of critical facilities identified.

The structures are organized under the following categories with their coordinating numbers:

Table 161: Emergency Support Functions

ESF Category	# of Structures
ESF 1- Transportation	19
ESF 2- Communications	16
ESF 3- Public Works	22
ESF 4- Firefighting	61
ESF 5- Information and Planning	290

ESF Category	# of Structures
ESF 6- Mass Care	8
ESF 7- Resource Support	14
ESF 8- Health and Medical	51
ESF 9- Search and Rescue	1
ESF 10- Hazardous Materials	11

Among the Critical Infrastructure not included in the above table are County, Federal, State and Lincoln authority bridges. According to the County Engineer, there are 10 bridges under 20 feet and 296 bridges that are over 20 feet, for a total of 306 bridges.

The list of structures and addresses described by the ESF may be found in the LEOP, and is maintained by the Lincoln/Lancaster Emergency Operations Center (EOC).

Warning siren locations and ranges were also identified through discussions with the Lancaster County Emergency Manager. The Lincoln/Lancaster EOC maintains a listing of all sirens in the County and can trigger all of them from their office in Lincoln, NE. All the sirens are on a regular maintenance schedule.

- Pink: Federal T22 90 decibels 2000 FT Effective Range
- Green: Federal Thunderbolt 104 decibels 4000 FT Effective Range
- Yellow: Federal Signal Sirens 128 decibels 5280 FT Effective Range

In Lincoln, the electric system is organized in a grid style which helps ensure there is power always reaching the sirens. Many communities within Lancaster County's sirens are powered by AC single source power. This is not desired, as they are inoperable when the power goes out.

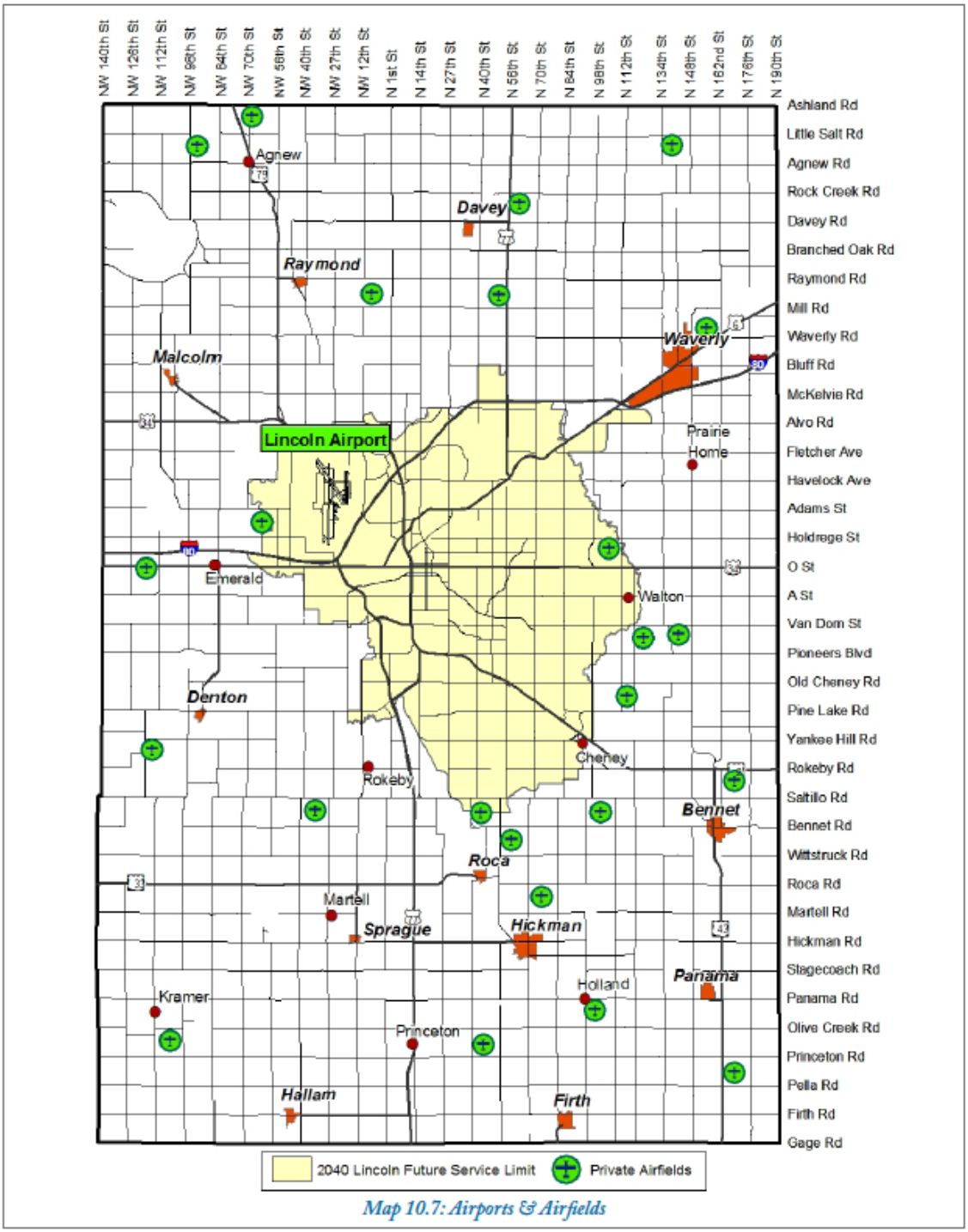
Lancaster County is the only county in Nebraska to have sirens at recreational facilities and lakes that provide camping.

RURAL WATER DISTRICT #1

Rural Water District #1 serves Lancaster County's rural customers as well as the communities of Bennet Panama, and Roca. The district has a total of 7 water towers and ground storage that is located south of Bennet that supplies all of the district's customers.

TRANSPORTATION SYSTEM

Figure 127: Transportation System



Map 10.7: Airports & Airfields

Roadways
The major highways that run across the counties are:

- Interstate 80
- Interstate 180
- U.S. Highway 6
- U.S. Highway 34
- U.S. Highway 77
- Nebraska Highway 2
- Nebraska Highway 33
- Nebraska Highway 43
- Nebraska Highway 79

SCHOOLS
The Lincoln Public School (LPS) district includes at total of 37 elementary schools, 11 middle schools, 6 high schools, and 7 other sites. There are also 9 public rural school districts and several private and parochial schools within the City of Lincoln. Schools are addressed in the Participant Sections.

Risk Assessment

HISTORICAL OCCURRENCES
The events recorded by NCDC are broken down to two types: county-based and zone-based events. The county-based records are events that affect the jurisdictions within the county while the zone-based records are those affecting the zone that include the county as part of the affected zone. Please refer to specific villages or cities within the county for the previous county-based severe weather events retrieved from NCDC. For zone-based events, there are 136 recorded events from 1996 to 2013 but due to the large number of events in the record only those that resulted in property or crop damages are listed in the following table.

Table 162: NCDC Severe Weather Events

Hazard	Date	Extent	Property Damage	Crop Damage
Cold/Wind Chill	1/19/1996		100.00K	0.00K
Heavy Snow	10/25/1997		16.000M	200.00K
High Wind	4/19/1996	52 kts.	2.00K	0.00K
High Wind	10/26/1996	50 kts.	25.00K	0.00K
Strong Wind	10/27/2010	42 kts. MG	5.00K	0.00K
Winter Weather	12/3/2011		75.00K	0.00K

The five hazards of most concern to Lancaster County are: tornados, high winds, severe thunderstorms, severe winter storms, and flooding.

TORNADOS
The county planning team identified tornados as the top concern for the community. This is consistent with the entire planning area. According to the NCDC data there were 15 recorded tornadoes that resulted in total property damage of $100,300,000.

Lancaster County reported that they have annual tornadic occurrences throughout the entire county, particularly during the months of April, May, and June. These three months account for 60 percent of these events. No other historical occurrences were reported by residents, county officials, or found in any other document. For community specific events, refer to each jurisdiction within the County's participant section.

HIGH WINDS

The county planning team identified high winds as a significant concern for the community. This is consistent with the entire planning area. According to the NCDC data there were 79 storm events which included strong winds (50+ kts) which can cause trees to uproot, considerable structure damage, and over turning of improperly anchored mobile homes. In addition, 23 recorded high wind and strong wind events also caused $32,000 in property damage.

Lancaster County reported that they have annual high wind occurrences throughout the entire county, particularly during the months of April, May, and June. These three months account for 60 percent of these events. No other historical occurrences were reported by residents, county officials, or found in any other document. For community specific events, refer to each jurisdiction within the County's participant section.

SEVERE THUNDERSTORMS

The county planning team identified severe thunderstorms as a significant concern for the planning area. This is consistent with the entire planning area.

The county has older housing stock and an aging population, both of which may lead to greater levels of vulnerability. Severe thunderstorms and hail can result in loss of electricity, blocked roadways, damages to trees, and flooding. Blocked roadways, as a result of downed threes, may also present life safety concerns to those needing immediate medical attention.

Damages to roofs and siding can result in significant losses for homeowners as well as business owners. CFs can also be damaged by hail events. 66 of the 241 hail events recorded by the NCDC for Lancaster County reported hail of one inch; using the TORRO Hailstone Scale expected impacts form this type of event include damages to trees and crops, broken glass, and damages to plastic outdoor structures. 30 of the hail events reported hail stones of one and three quarter inches; stones of this size can result in wholesale destruction of glass, damage to tiled roofs, and is cause for concern related to the safety of residents as stones of magnitude pose a significant risk to persons and can cause injuries. Among these recorded hail events, the one occurred in Firth on July 20, 2000 caused $2 million in property damage and $1 million in crop damage. There were also 11 lightning events recorded by NCDC that resulted in a total of $936,400 of property damages. In addition, 81 thunderstorm events reported a total of $1,505,000 in property damage.

No other historical occurrences were reported by residents, county officials, or found in any other document. For community specific events, refer to each jurisdiction within the County's participant section.

SEVERE WINTER STORMS

The county planning team identified severe winter storms as a significant concern for the community. This is consistent with the entire planning area. NCDC data records severe winter storms as "zonal" events and there are 61 recoded events. Two of the recorded events resulted in a total of 16,075,000 dollars of property damage and 200,000 dollars of crop damage.

The elderly may be more likely to sustain an injury or have a medical emergency as a result of shoveling snow following a winter storm. Community members and families below the poverty line are also as higher risk related to severe winter storms, as they may lack resources needed to sustain themselves through a major severe winter storm.

FLOODING

The local planning team identified flooding as a significant concern for the community. The planning team estimated that flooding could impact up to 40 percent of residents and 40 percent of properties within the community. There is also the potential that CFs and services could be interrupted between one day and one week.

There were 23 floods recorded for Lancaster County by the NCDC. The most costly was a flash flood in Panama. On May 8, 1996, after two days of rain, southern Lancaster County received between six and nine inches of rain. The abundant amounts of rain resulted in a flash flood on the Salt Creek at Roca, Lincoln and Greenwood. The estimated damages from the flooding were $1.5 million. Another flood that reported monetary damages was in Lincoln on August 14, 1996 where a flash flood from four inches of rain caused $60,000 in property damage to local businesses and homes.

Lancaster County reported that annually there are various creeks, streams and urban flooding events. However, the LEOP states that flooding has been significantly reduced by recent flood control projects.

According to the Comprehensive Plan, "Approximately 13.8% of Lancaster County is covered by floodplains." Lancaster County and the City of Lincoln have both adopted a No Adverse Impact approach to floodplain management. This approach seeks to insure that the actions of any one property owner do not impact others in an adverse fashion.

No other historical occurrences were reported by residents, county officials, or found in any other document. For community specific events, refer to each jurisdiction within the County's participant section.

EARTHQUAKE

No earthquakes have been reported by the local planning team and no recorded earthquake events are found within the planning area. However, the LEOP does discuss the potential impacts to dams in the event of an earthquake and the county is astride the Humbolt Fault Line.

Current building codes do not include seismic provisions, as a result of which damages in the event of an earthquake might be more pronounced than if such codes were in place. At this time, earthquake will not be fully examined in this section. For more information, please refer to *Section Four: Risk Assessment*.

URBAN FIRE

Lancaster County identified urban fire as a significant concern. Currently, the Lincoln Fire Department operates 14 stations which are spread across the community and meet the National Fire Protection Association standards for response time. However, according to the current Comprehensive Plan: "Lincoln Fire and Rescue has repeatedly stated that maintaining desirable response times is becoming increasingly difficult in areas that have experienced urban growth further and further away from existing fire stations." The Fire Department is expecting to look at both relocation of stations as well as creation of new stations in anticipation of future growth.

Some rural fire districts are located outside of the incorporated areas, and rely on mutual aid requests as needed.

Table 163: Calls Responded to by Fire Departments in Lancaster County

Fire Department	Fire	Over Pressure Rupture	Rescue/ EMS	Haz Mat	Service Calls	Good Intent Calls	False Alarms	Severe Weather	Special Incidents
Bennet Rural Fire District	0	0	0	0	0	0	0	0	0
Firth Rural Fire District	64	1	244	7	16	50	21	2	1
Hallam Vol. Fire and Rescue	61	0	16	9	1	3	11	0	1
Hickman Rural Fire and Rescue	143	0	555	16	25	141	51	3	2
Lincoln Fire and Rescue	1,927	264	490	2,234	4,505	2,392	5,190	55	661
Malcolm Fire and Rescue	0	0	0	0	0	0	0	0	0
Raymond Vol. Fire and Rescue	202	0	571	23	16	28	15	1	0
Southeast Rural Fire District	0	0	0	0	0	0	0	0	0
Southwest Rural Fire District	0	0	38	0	0	0	0	2	0
Waverly Fire and Rescue	171	0	860	35	58	143	54	1	1
Lancaster County	**2,568**	**264**	**2,774**	**2,323**	**4,621**	**2,757**	**5342**	**64**	**666**

TERRORISM

Lancaster County identified terrorism as a significant concern. There have been five reported instances of terrorism in Lancaster County, but the LEOP does rank terrorism as a moderate concern. All of the terrorism events were reported at government buildings within Lincoln or on the campus of the University of Nebraska. Terrorism can include a wide range of activities, with a very wide range of impacts.

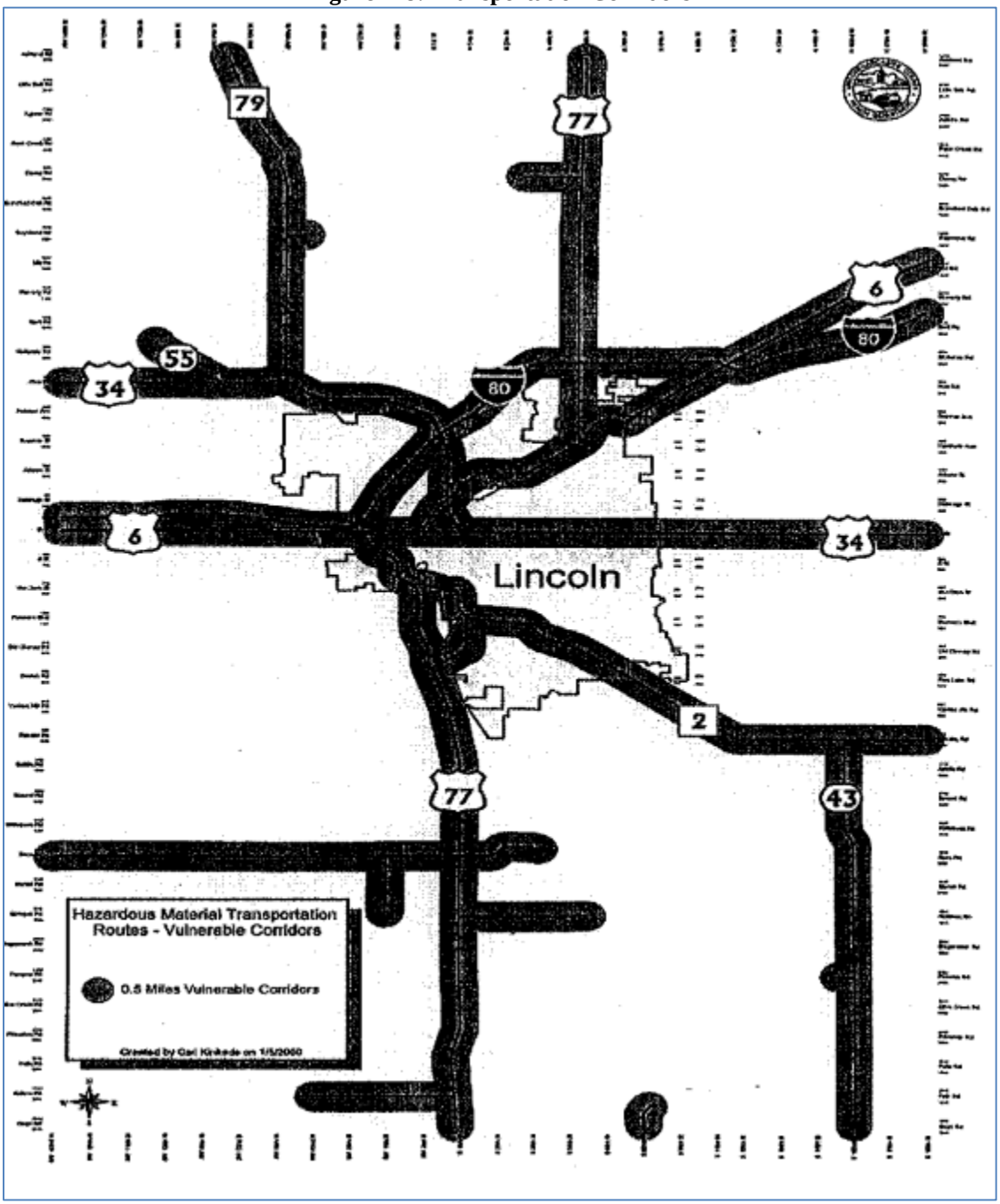
Table 164: Terrorist Events Reported in Lancaster County

Date	*Event*	*Area Impacts*	*Results*	*Injuries*
06/12/13	White Powder Discovered in an Envelope	Nebraska Department of Motor Vehicles	Evacuation of DMV	None
01/21/13	White powder in an envelope	Apothecary Building, Lawyer's office	None	None
02/24/11	Gunman on UNL's East Campus	University of Nebraska-Lincoln, East Campus and Wesleyan College Campus	Campus locked down for 90 minutes	None
12/04/07	White powder in an envelope	Immigration and Naturalization Service Building	None	None
06/09/05	Powder Discovered in the mailroom	Immigration and Naturalization Service Building	Evacuation of INS	None

CHEMICAL TRANSPORTATION

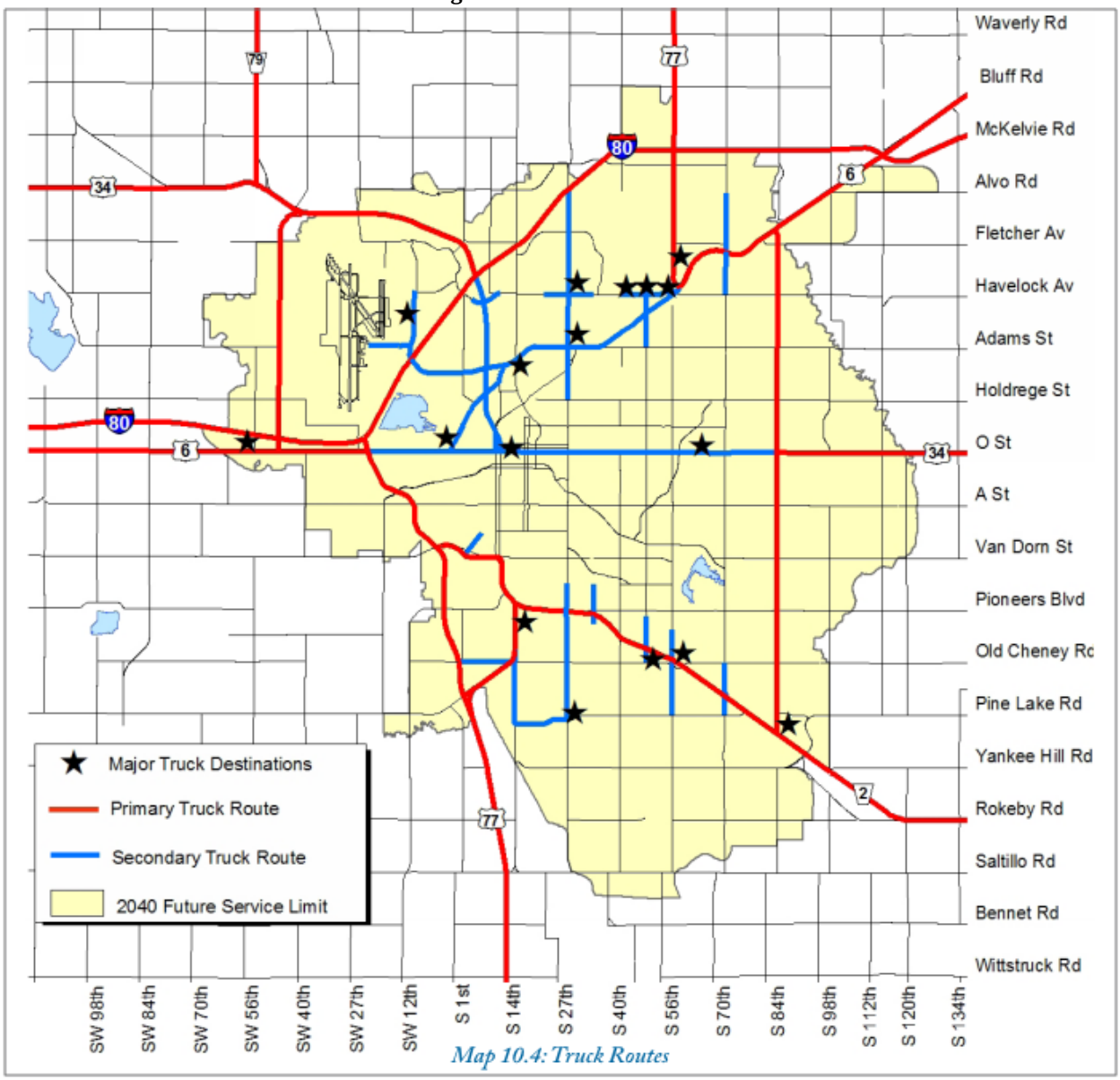
Lancaster County identified chemical transportation as a significant concern. According to the LEOP there have been several spills/leaks involving anhydrous ammonia and two propane leaks. Additionally, there have been chemical leaks and natural gas leaks and explosions. The LEOP ranks this hazard as one of the highest for the county. The following map, from the LEOP, illustrates transportation corridors.

Figure 128: Transportation Corridors



The following map, from the Comprehensive Map, illustrates existing truck routes.

Figure 129: Truck Routes



Capability Assessment

The capability assessment consisted of two main components: a Capability Assessment Survey completed by the jurisdiction; and, a review of local existing policies, regulation, plans, and the programs. The survey serves to gather information regarding the jurisdiction's planning and regulatory capability; administrative and technical capability; fiscal capability; and education and outreach capability.

- Lancaster County has many planning and regulatory mechanisms in place which can be utilized to promote safe and resilient development. The County/City Joint Comprehensive Plan 2040 pays special attention to regulating developments in floodplains as well as critical environmental resources such as watersheds, wetlands, and endangered species habitats. Please refer to Table 165 for the results of evaluating the local planning documents against the Safe Growth Audit. It should

be noted that not all of the planning documents in the county were examined for their linkage to the hazard mitigation plan and the county is encouraged to build strong connections between local traditional planning endeavors and this update of the hazard mitigation plan.

- Lancaster County has the staff resources to implement mitigation programs and projects on their own. Many of the staff are experienced and have been with the jurisdiction for several years.
- Lancaster County has many fiscal mechanisms in place, such as CIP funding and the ability to leverage special purposes taxes, which can be utilized in support of hazard mitigation efforts.
- Lancaster County plays an active role in establishing public outreach programs and raises the public awareness of hazard mitigation issues.
- The RWD undertakes monitoring during the week and has the ability to impose water restrictions when supply is insufficient. Restrictions are based upon the recovery period for the above ground water supply. However, there has not been a restriction needed in 12 years.

Table 165 provides detailed information regarding the survey completed by the local planning team.

Table 165: Capability Assessment

Survey Components/Subcomponents		Comments
Planning & Regulatory Capability	Comprehensive Plan	Yes
	Capital Improvements Plan	Yes
	Hazard Mitigation Plan	Yes
	Economic Development Plan	Yes
	Emergency Operational Plan	Yes
	National Resources Protection Plan	Yes
	Floodplain Management Plan	Yes
	Storm Water Management Plan	Yes
	Zoning Ordinance	Yes
	Subdivision Regulation/Ordinance	Yes
	Floodplain Ordinance	Yes
	Building Codes	Yes
	National Flood Insurance Program	Yes
	Community Rating System	No
	Well Head Protection Area/District	Yes
	Other (if any)	N/A
Administrative & Technical Capability	Planning Commission	Staff: 5+; Tenure: 4+ years
	Hazard Mitigation Planning Commission	Staff: 5+; Tenure: 4+ years
	Floodplain Administration	Staff: 5; Tenure: 1-3 years
	Emergency Manager	Staff: 3; Tenure: 4+ years
	GIS Coordinator	Staff: 1; Tenure: 4+ years
	Chief Building Official	Staff: 1; Tenure: 4+ years
	Civil Engineering	Staff: 5+; Tenure: 4+ years
	Staff Who Can Assess Community's Vulnerability to Hazards	Staff: 5+; Tenure: 4+ years
	Grant Manager	Staff: 2; Tenure: 4+ years
	Other (if any)	N/A
Fiscal	Capital Improvement Project Funding	Yes

Survey Components/Subcomponents		Comments
Capability	Community Development Block Grant	Yes
	Authority to Levy Taxes for Specific Purposes	Yes
	Gas/Electric Service Fees	Yes
	Storm Water Service Fees	Yes
	Water/Sewer Service Fees	Yes
	Development Impact Fees	Yes
	General Obligation Revenue or Special Tax Bonds	Yes
	Other (if any)	Yes (Various grants applied for and received from DHS and/or FEMA)
Education & Outreach Capability	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes
	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes
	Natural Disaster or Safety related school programs	Yes
	StormReady Certification	Yes
	Firewise Communities Certification	No
	Tree City USA Program	No
	Public-private partnership initiatives addressing disaster-related issues	Yes
	Other (if any)	N/A

PLAN EVALUATION

The Lincoln/Lancaster Comprehensive Plan addresses the natural environment in many ways, under the umbrella of Environmental Stewardship and Sustainability. The plan addresses natural resource preservation through land use, as well as discussing the need to ensure community resilience in the face of natural disasters.

The results of applying the Safe Growth Audit (see *Section Six: Plan Implementation and Maintenance*) to evaluating the Lincoln/Lancaster County Comprehensive Plan 2040, the findings are demonstrated in the table below.

Table 166: Safe Growth Audit

Component		Items	I (Included)
Comprehensive Plan	Land Use	Identify hazard areas	I
		Land-use policy that discourages (re)development within hazard areas	I
		Provide adequate area for growth outside hazard areas	I
	Transportation	Limit access to hazard areas	
		Policy that guides growth outside hazard areas	
		Emergency functional designs	
	Environmental Management	Identify and map environmental systems that protect development from hazards	
		Policy that maintains and restore protective ecosystems	I
		Policy that provides incentives to developments outside protective ecosystems	
	Public Safety	Goals and policies are related to hazard plan	I
		Plan's growth and development policies that explicitly include safety	I
		Monitoring and implementation section cover safe growth objectives	
Zoning Ordinance		discouraging (re)development within hazard areas	I
		Contain natural hazard overlay zones that set conditions for land use within such zones	
		Recognize hazard areas as limits in rezoning procedures	
		Prohibit development within, or filling of, wetlands, floodways, and floodplains	I
Subdivision Regulation		Restrict the subdivision of land within or adjacent to hazard areas	I
		Conservation subdivisions or cluster subdivisions to conserve environmental resources	
		Allow density transfers where hazard areas exist	

Mitigation Actions

COMPLETED MITIGATION ACTIONS

The following mitigation actions have been completed since the 2008 HMP.

Alert and Warning Systems for all Communities in Lancaster County

Description: Ensure that all communities have access to sirens.
Hazard(s) Addressed: All
Priority: Medium
Lead Agency: Lancaster County Emergency Management
Status: Complete

Purchase and issue weather radios for schools and CFs

Description: Conduct an inventory of weather radios at schools and other CFs and provide new radios as needed.
Hazard(s) Addressed: All
Priority: High
Lead Agency: Lancaster County Emergency Management
Status: Complete

Update Emergency Operations Center

Description: Update Emergency Operations Center.
Hazard(s) Addressed: All
Priority: High
Lead Agency: Lancaster County Emergency Management
Status: Complete

Complete a County Wide Master Plan to prioritize all flooding related projects

Description: Stormwater master plans can be conducted to perform a community-wide stormwater evaluation, identifying multiple problem areas, and potentially multiple drainage improvements for each.
Hazard(s) Addressed: Flooding
Priority: High
Lead Agency: Lancaster County Public Works
Status: Complete

Work with stakeholders to develop a database of vulnerable populations and organizations which support them

Description: Develop a database of vulnerable populations and supporting organizations.
Hazard(s) Addressed: All
Priority: High
Lead Agency: Aging Partners & Lancaster County Emergency Management
Status: Complete

NEW OR PREVIOUSLY IDENTIFIED MITIGATION ACTIONS

The following hazard mitigation actions were ranked high by Lancaster County, or were noted as being underway since the previous hazard mitigation plan.

Implement Water Conservation Awareness Programs, such as pamphlets

Description: Improve and/or develop a program to conserve water use by the citizens during elongated periods of drought. Potential restrictions on water could include limitations on lawn watering, car washing, or water sold to outside sources. Work with DNR on farm irrigation restrictions.
Hazard(s) Addressed: Drought
Estimated Cost: $1,000 +
Potential Funding: PDM, HMGP, LPSNRD, Lancaster County
Timeline: Ongoing
Priority: Medium
Lead Agency: LPSNRD & Lancaster County Emergency Management
Status: In Progress: education materials available through Lancaster County Emergency Management and Department of Public Works

Reverse 911 System for Notification of residents and businesses

Description: Reverse 911 systems can allow for notification of residents in the event of an emergency.
Hazard(s) Addressed: All
Estimated Cost: $5,000
Potential Funding: PDM, HMGP, LPSNRD, Lancaster County
Timeline: 1-2 Years
Priority: High
Lead Agency: LPSNRD, Lancaster County Emergency Management
Status: In Progress

Public Education

Description: Increase public awareness of vulnerability and risk reduction measures through hazard education.
Hazard(s) Addressed: All
Estimated Cost: $0 - $1,000
Potential Funding: PDM, HMGP, LPSNRD, Lancaster County
Timeline: Ongoing
Priority: Medium
Lead Agency: NEMA, LPSNRD, Lancaster County Emergency Management
Status: In Progress

Storm Shelters

Description: Identify, design, and develop storm shelters to protect community and critical facilities.
Hazard(s) Addressed: Tornados and High Winds, Severe Thunderstorms
Estimated Cost: $200-$300/sf stand alone; $150-200/sf addition/retrofit
Potential Funding: PDM, HMGP, LPSNRD, Lancaster County
Timeline: 5 Years
Priority: Medium
Lead Agency: LPSNRD, NEMA, & Lancaster County Emergency Management
Status: Not Yet Started

Assist Jurisdictions with Tree City Designation

Description: Assist jurisdictions working to become a Tree City USA through the National Arbor Day Foundation in order to receive direction, technical assistance, and public education on how to establish a tree maintenance program in order to maintain trees in a community to limited potential damages when a storm event occurs. The four main requirements include: 1) Establish a tree board; 2) Enact a tree care ordinance; 3) Establish a forestry care program; 4) Enact an Arbor Day observance and proclamation.
Hazard(s) Addressed: Severe thunderstorms, tornados and high winds, severe winter storms
Estimated Cost: $0
Potential Funding: Lancaster County
Timeline: 3-5 years
Priority: Low
Lead Agency: Lancaster County Emergency Management
Status: In Progress

Educate local businesses about the value of continuity planning

Description: Continuity planning helps to ensure that services can be maintained during and after a disaster.
Hazard(s) Addressed: All
Estimated Cost: $0
Potential Funding: N/A
Timeline: Ongoing
Priority: Low
Lead Agency: Lancaster County Emergency Management
Status: In Progress

Improve storm sewers and drainage patterns in and around the County

Description: Undersized systems can contribute to localized flooding. Stormwater system improvements may include pipe upsizing and additional inlets. These improvements can serve to more effectively convey runoff, preventing interior localized flooding. Retention and detention facilities may also be implemented to decrease runoff rates while also decreasing the need for other stormwater system improvements.
Hazard(s) Addressed: Flooding
Estimated Cost: $100,000 +
Potential Funding: PDM, HMGP, CDBG, LPSNRD, Lancaster County
Timeline: 3-5 years
Priority: High
Lead Agency: Lancaster County Public Works and Emergency Management
Status: In Progress: A part of regular maintenance program

Maintain Good Standing with the NFIP

Description: Maintain good standing with National Flood Insurance Program (NFIP).
Hazard(s) Addressed: Flooding
Estimated Cost: $0
Potential Funding: N/A
Timeline: Ongoing
Priority: High
Lead Agency: Lancaster County Public Works & Emergency Management, Floodplain Administrator
Status: Ongoing

Develop continuity plans for critical community services

Description: Continuity planning helps to ensure that services can be maintained during and after a disaster.
Hazard(s) Addressed: All
Estimated Cost: $0
Potential Funding: N/A
Timeline: 5 Years
Priority: Low
Lead Agency: Lancaster County Emergency Management
Status: In Progress

Encourage the use of hail resistant roofing

Description: Educate the public and business owners regarding hail resistant roofing.
Hazard(s) Addressed: Severe Thunderstorms
Estimated Cost: $0
Potential Funding: Lancaster County
Timeline: 1 Year
Priority: High
Lead Agency: Lancaster County Building Code Officials
Status: Developing educational materials

Utilize low impact development practices and green infrastructure to reduce flood risk

Description: Low impact development practices and green infrastructure can reduce runoff and result in a reduction in stormwater related flooding
Hazard(s) Addressed: Flooding
Estimated Cost: Varies
Potential Funding: Lancaster County
Timeline: Ongoing: Community will implement projects as they are identified
Priority: High
Lead Agency: LPSNRD & Lancaster County Public Works, Floodplain Administrator
Status: Not Yet Started

Green Mitigation

Description: Educate the public and business owners regarding rain gardens, green roofs, and other minor mitigation measures.
Hazard(s) Addressed: All Hazards
Estimated Cost: Varies
Potential Funding: Lancaster County
Timeline: Ongoing
Priority: High
Lead Agency: LPSNRD & Lancaster County Emergency Management, Flood Administrator
Status: In Progress

Shelter-In-Place Training

Description: Ensure that all CFs, businesses, and residents located near major transportation corridors are aware of how to safely shelter in place in the event of a chemical incident.
Hazard(s) Addressed: Chemical Transportation and Transportation
Estimated Cost: $1,000 +
Potential Funding: Lancaster County
Timeline: 3-5 years
Priority: Medium
Lead Agency: Lancaster County Emergency Management
Status: In Progress

Participant Section for Lincoln

LPSNRD
Multi-Jurisdictional Hazard Mitigation Plan

March 2015

Community Profile

HISTORY

Lincoln is the capitol city of Nebraska and is the seat of the county government. Originally known as "Lancaster," the City's name was changed to Lincoln after a legislative motion. The City was incorporated on April 7, 1869.

To ensure that the City would prosper, state government and major state institutions were moved to Lincoln. The City also worked hard to recruit railroad services by offering bounties. In fact, the first train arrived and claimed a $50,000 prize on June 26, 1870. Thereafter, the City's population went from 2,500 residents in 1870 to 7,000 residents by 1875, and 13,000 residents by 1880.

Lincoln continued to grow and expand in every direction by 1890, except to the northwest where the rail yards and Salt Creek acted as barriers for the burgeoning 55,000 residents. It was the nationwide depression in the 1890's that adversely impacted Lincoln's population causing a decline to 37,000 by 1900. However, by the early 20th century a significant influx of Germans from Russia helped bolster the city.

In the late 1800's, satellite towns just outside the city began to emerge:

- In 1888, East of Lincoln's city limits, Nebraska Wesleyan University was established. The following year the site was incorporated as "University Place." By 1926 the community had reached 5,000 residents and was incorporated.
- In 1889, Nebraska Christian University was established. The community in 1890 was incorporated as "Bethany Heights." In 1922 the community residents voted to join Lincoln, and it wasn't until four years later was it annexed.
- In 1892, "College View" was incorporated with 1,000 residents. In 1929 Lincoln annexed the community when the population reached 2,900.
- The blue-collar suburban town of "Havelock", northeast of University Place, was incorporated in 1893. Havelock grew to 3,602 residents by 1920 and actively opposed annexation by Lincoln, until a strike by the Burlington Shops in 1922 continued without resolution.
- West Lincoln, which was established in 1887 on the west bank of the Salt Creek, was annexed in the 1960's after an increased interest in aviation was spawned as a result of the Lincoln Army Air Field (1942). Over 25,000 aviation mechanics were trained in Lincoln and 40,000 troopers were processed for combat through the facility.

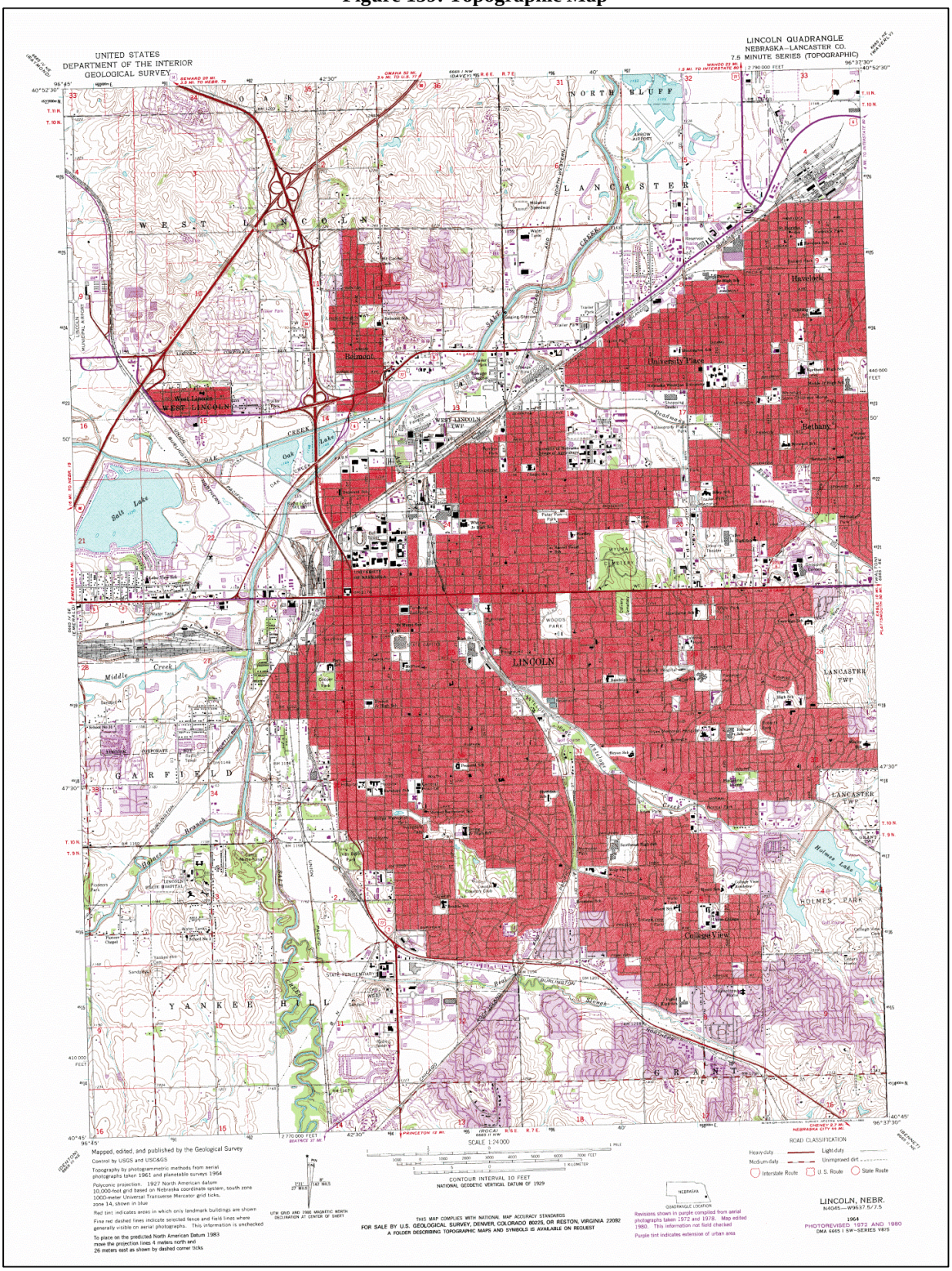
LOCATION/GEOGRAPHY

The City of Lincoln is the center and most populated city of Lancaster County. Located 55 miles west of the eastern state border, the City covers an area of 75.4 square miles comprised of 0.98% water. Originally laid out near Salt Creek, the area was selected for its salt flats, marshes, and nearly flat saline wetlands. Lincoln's landscape is mainly comprised of gently rolling hills and sits at 1,189 feet above sea level.

Lincoln's Salt Creek Watershed is comprised of a series of sub-basins such as; Antelope Creek, Beal Slough, Cardwell, Dead Man's Run, Haines Branch Salt Creek, Havelock, Little Salt Creek, Lynn, Middle Creek, Oak Creek, Southeast Upper Salt Creek , and Stevens Creek basins. Below in Figure 159, is Lincoln's watershed map as provided by the City of Lincoln's website: http://lincoln.ne.gov/city/pworks/watrshed.

Figure 158: Watershed Map

Figure 159: Topographic Map



Source: http://snr.unl.edu/data/geographygis/digitalraster/DRGdownloads.asp

DEMOGRAPHICS

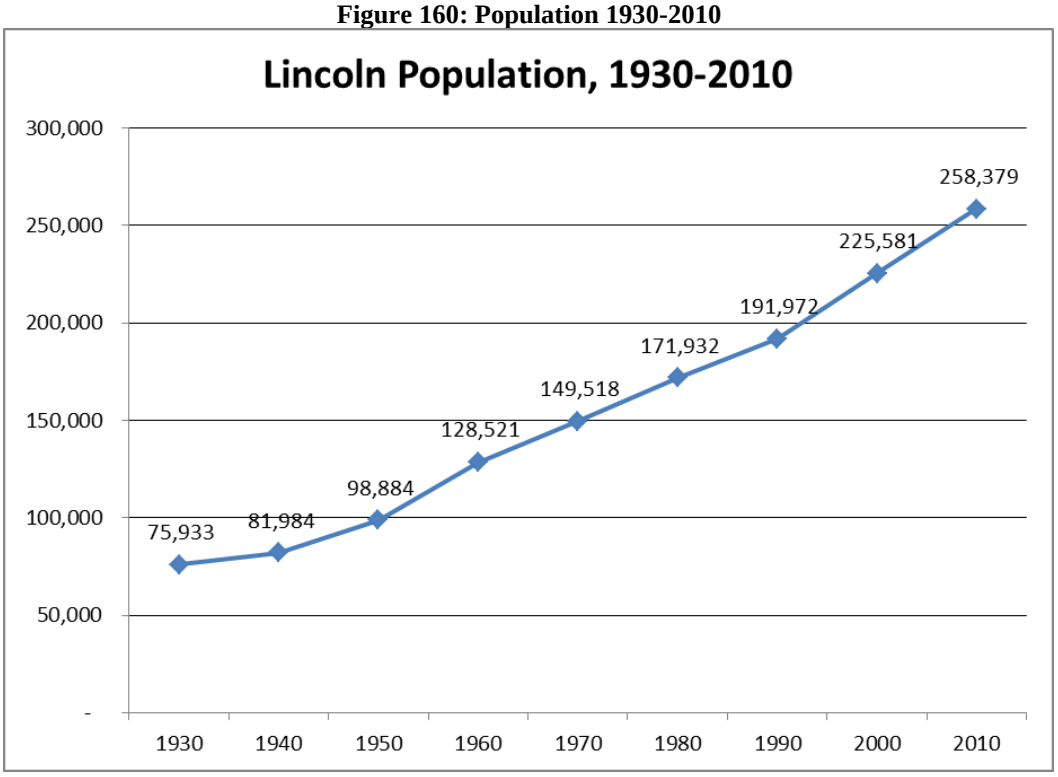
Lincoln's population has steadily increased from 1930 to 2000. Some of the increase was the result of the annexations of surrounding communities. The population has nearly tripled since 1930 to 2010 from 75,933 residents to 258,379 residents.

Between the years of 1990 and 2000, Lincoln and Lancaster County's minority communities more than doubled; markedly occurring within the Black/African Americans, Asians, and "Other" racial groups. This trend is anticipated to continue into the future.

The City of Lincoln's population makes up about 90% of Lancaster County's population. The Lincoln/Lancaster County Comprehensive Plan indicates that Lincoln's population is expected to reach 350,000 by 2030, growing at a rate of about 1.5% per year.

Lincoln's population density since 1970 has remained about 3,000 persons per square mile. The Lincoln/Lancaster County Comprehensive Plan expects that the overall city-wide population density to stay around 3,000 persons per square mile for the next 25 years.

Figure 160: Population 1930-2010



Source: U.S. Census Bureau, 2010, (DP4)

The age distribution and median age of individuals in Lincoln compares with the broader county population as show below. Lincoln's age population structure is very similar with that of the county.

Table 205: Population by Age

Age	Lancaster County	Lincoln
<5	8.0%	7.2%
5-64	83.9%	82.1%
>64	8.1%	10.7%
Median	30.4 years	31.8 years

Source: U.S. Census Bureau, 2010 American Community Surveys 5-year Estimates

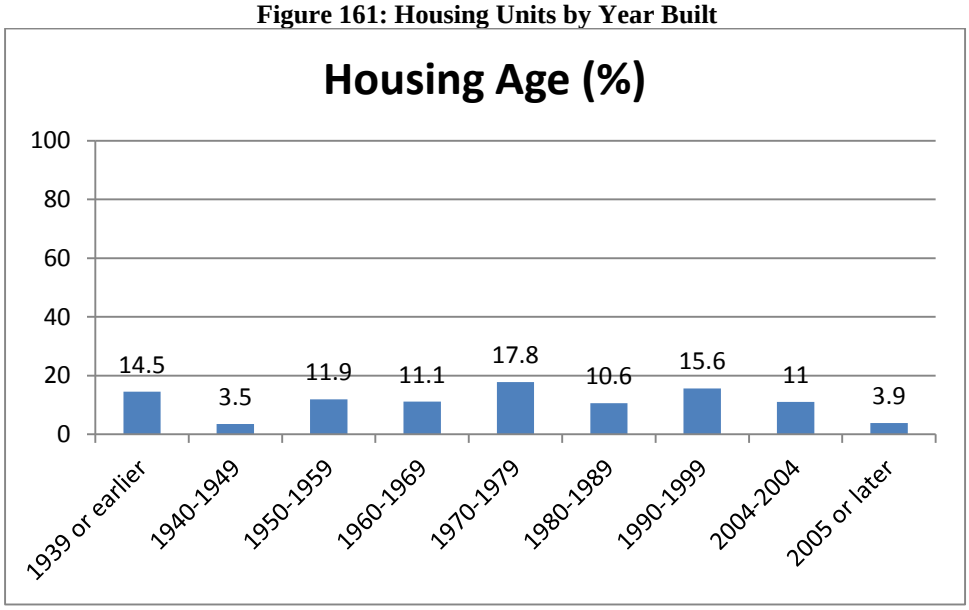
Median household income, per capita income, home value and rent for the city as a whole compare with broader county values as shown below.

Table 206: Housing and Income

	Lancaster County	Lincoln
Median Household Income	$50,849	$48,846
Per Capita Income	$25,949	$25,146
Median Home Value	$145,400	$140,600
Median Rent	$668	$667

Source: U.S. Census Bureau, 2010 American Community Surveys 5-year Estimates

Figure 161: Housing Units by Year Built



Source: U.S. Census Bureau, 2010 American Community Surveys 5-year Estimates

According to 2010 Census data, the city has 108,939 housing units; with 94% of those units occupied. 2187 units, or 2% of the village's housing, are classified as mobile homes. 29.9% of the village's housing units were built before 1960.

CITY GOVERNANCE

The City of Lincoln is governed by a Mayor and City Council. The City includes the following agencies, commissions, and departments (* indicates an agency which is shared with the County):

- Aging Partners*
- Building & Safety*
- Lincoln City Libraries*
- Planning*
- Purchasing*
- Public Works / Utilities Department
- Urban Development Department
- Health*
- Human Resources*
- Human Rights Commission*
- Information Services*
- Fire Department
- Police Department
- Parks & Recreation Department

FUTURE DEVELOPMENT TRENDS

As Lincoln's population grows, so too will the number of structures within the city. In 1990, Lincoln had 91% of Lancaster County's dwelling units at 79,079 units. From 1991 to 2000, dwelling unit construction permits were issued for 17,867 units in Lincoln. In 2000, Lincoln had 91.3% of Lancaster County's dwelling units at 95,199. From the 2011 Lincoln/Lancaster County Comprehensive Plan, it is assumed by 2040 an additional 52,100 dwelling units will be added within the County, with around 16% of these built within the existing City.

Urban growth in Lincoln is expected to expand in multiple directions around the City. Growth building on the foundations of Lincoln's established neighborhoods, as well as growth and strengthening of its downtown core, are the anticipated primary areas for urban growth and development.

The City of Lincoln encourages the preservation and renewal of historic buildings, districts and landscapes. Development in and around these areas is expected to maintain the integrity of these historical patterns and precedents. Additionally, conservation methods are expected to be implemented when developing in natural, and environmentally sensitive areas.

The following figure LIN 5 is the Future Growth Tier Map retrieved from Lincoln/Lancaster County Comprehensive 2040. It includes three tiers of growth for the City of Lincoln. Tier I reflects the "Future Service Limit," 34 square miles where urban services and inclusion in the city limits are anticipated within the 30 year planning period. This area should remain in its current use in order to permit future urbanization by the city. Tier II is an area of approximately 34 square miles that defines the geographic area the city is assumed to grow into immediately beyond Tier I. Tier III provides an approximately 131 square mile area for Lincoln's longer term growth potential. Figure X is the future land use map that displays the generalized location of each land use. Although all three tiers include some land in the 1% annual floodplain, the plan does state that: "The natural topography and features of the land should be preserved by new development to maintain the natural drainageways and minimize land disturbance."

Figure 162: Priority Growth

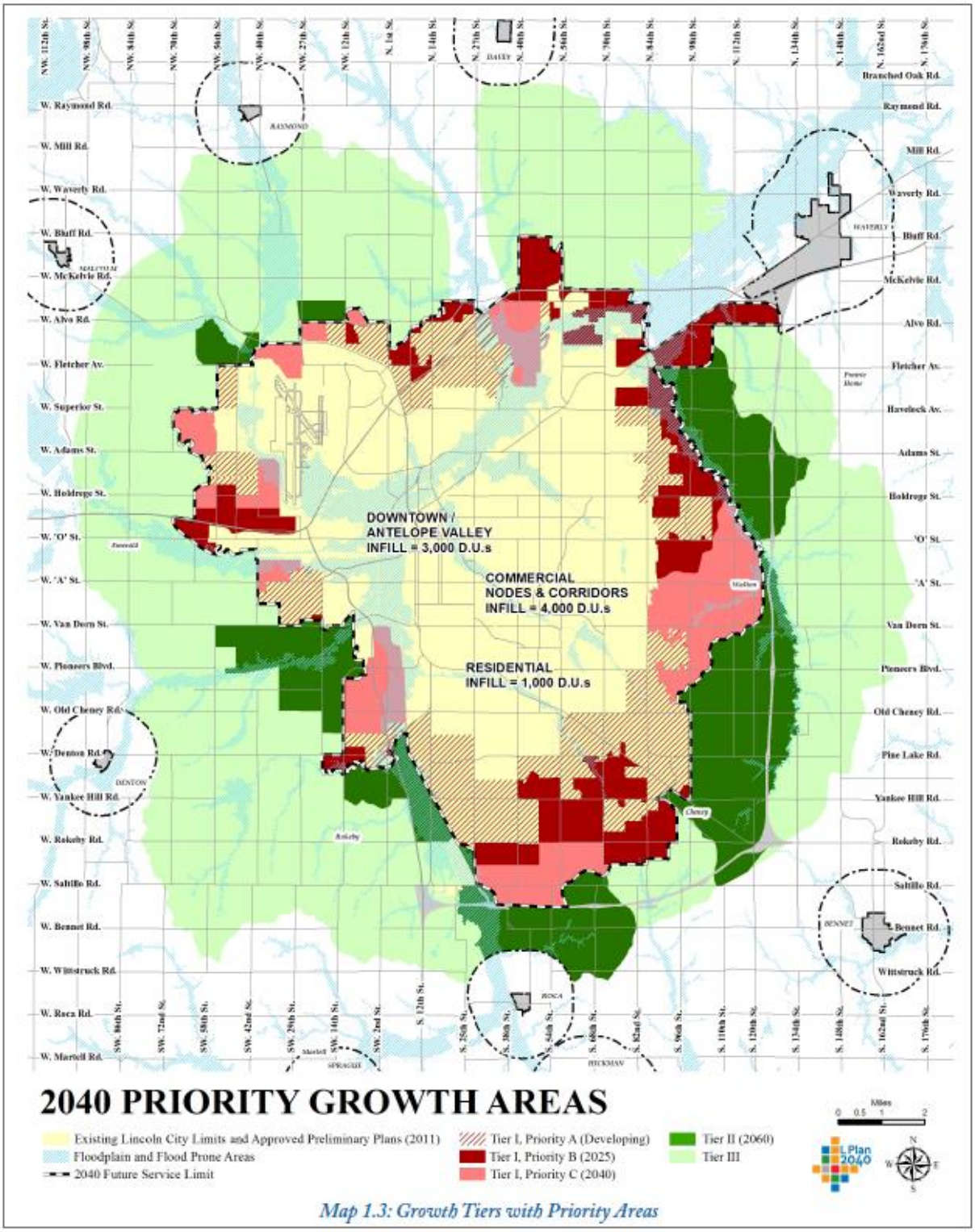
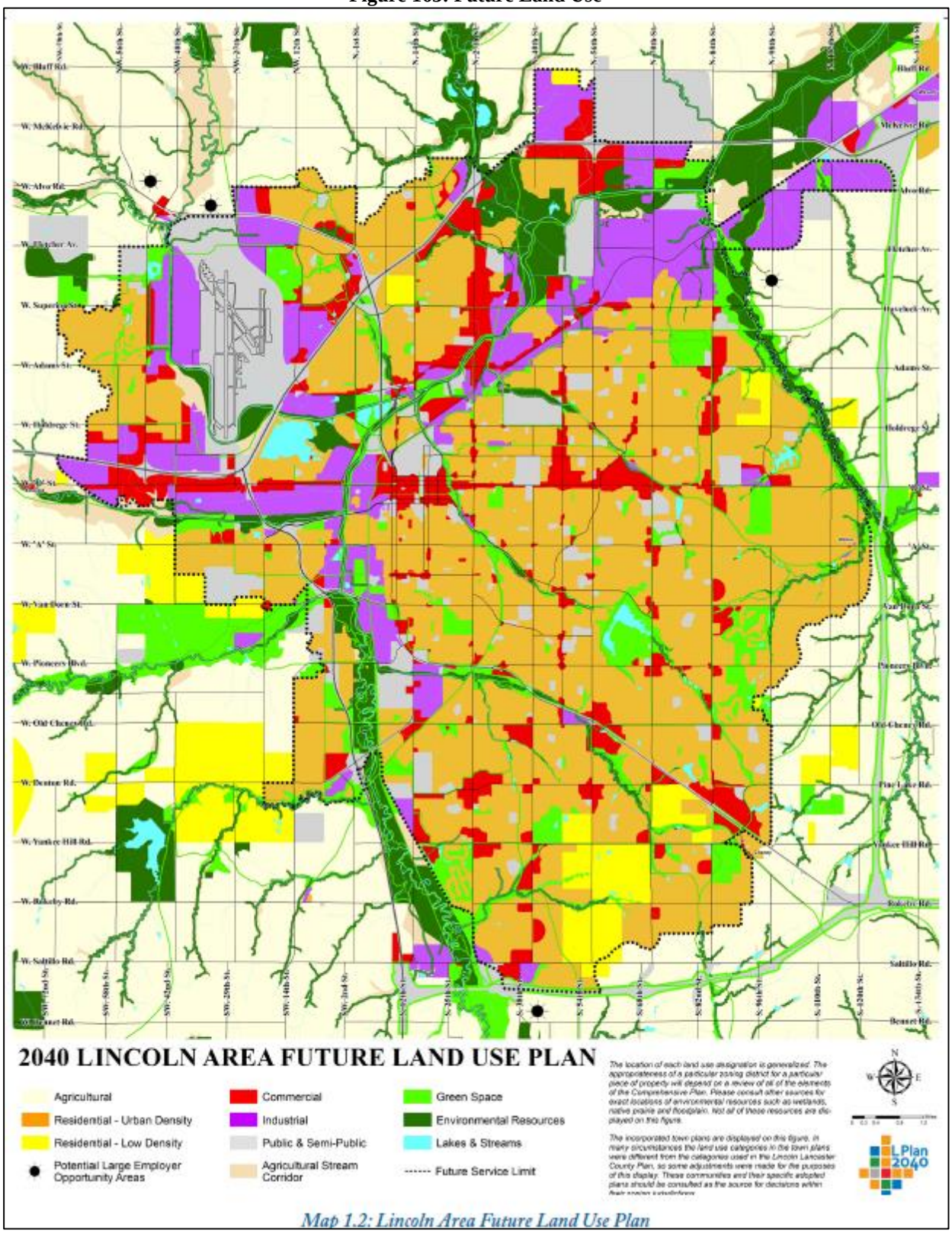


Figure 163: Future Land Use



Map 1.2: Lincoln Area Future Land Use Plan

STRUCTURAL INVENTORY AND VALUATION

Results from the structural inventory for the City of Lincoln are found in the table below. Information displayed in this table includes the number of structures, value per structure, and total value of each structure type. Of these structures, 36,536 are located in the 1% annual floodplain, with a total assessed value of $13,228,082,412. This represents around 1/3 of all structures.

Table 207: Structural Inventory

Structure Type	Number of Structures	Total Value	Value per Structure
Commercial/Industrial	6,319	$2,961,016,372	$468,589
Agricultural	5,513	$547,702,450	$99,347
Residential	75,958	$7,325,520,274	$96,274
Other	40,602	$6,281,462,478	$154,708
Total	**128392**	**$17,115,701,575**	**-**

Source: Nebraska Department of Revenue, Property Assessment Division

CRITICAL INFRASTRUCTURE/KEY RESOURCE

Each participating jurisdiction identified CFs vital for disaster response, providing shelter to the public, and essential for returning the jurisdiction's functions to normal during and after a disaster. CFs were identified during the 2008 planning process and updated by the Lincoln planning team during as a part of the plan update (refer to *Appendix C*). Below is a summary of the CFs for the jurisdiction. Due the large number of CFs in Lincoln, a list of all the facilities is not provided but those that are in the floodplain are listed below.

Table 208: Critical Facilities

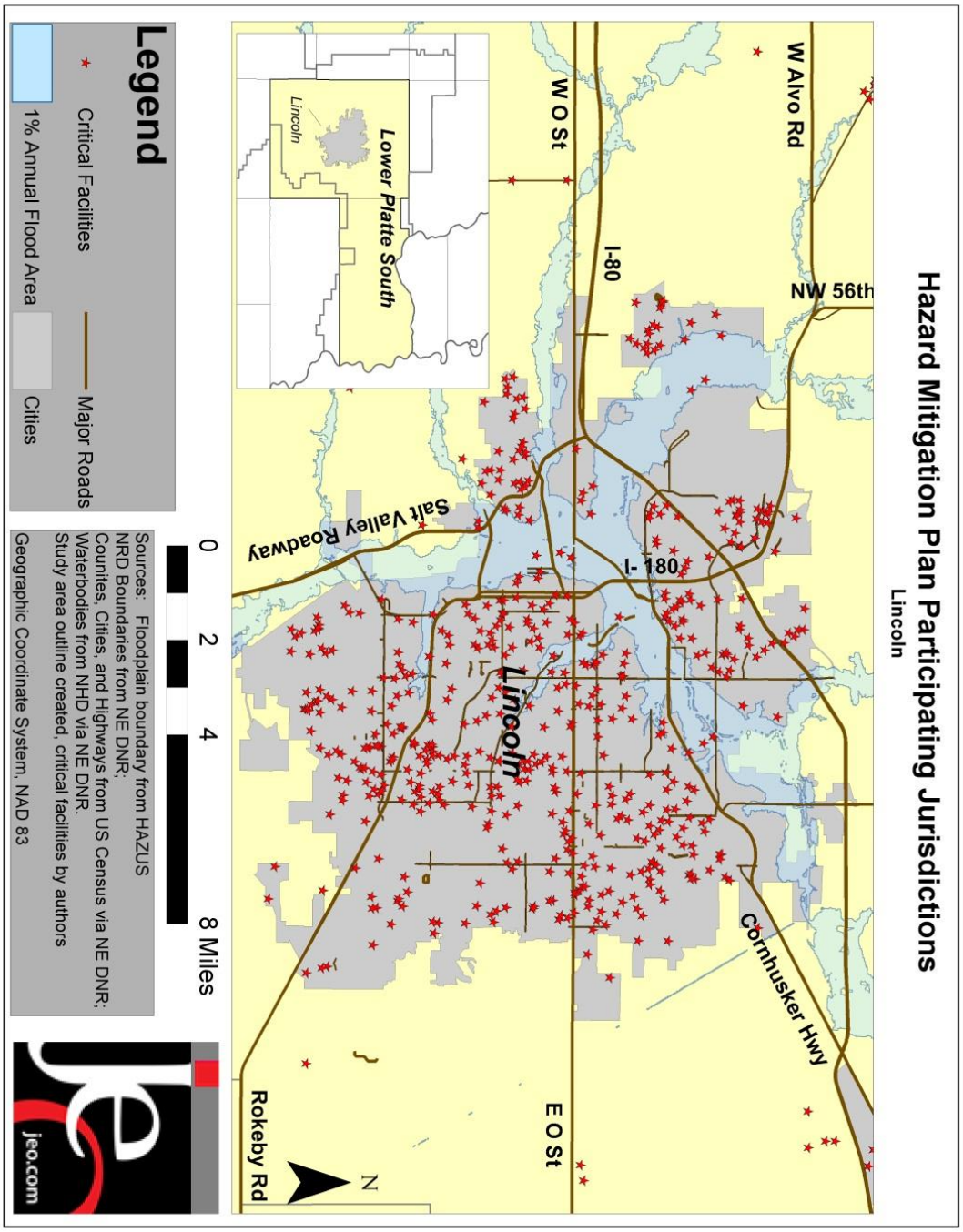
Critical Facility Type	#
Nursing Home/Child Care Center & Homes/Preschool	527
Fire Department	14
Law Enforcement/Police Station	12
Hospital/Emergency Center	9

Table 209: Critical Facilities in 1% annual Floodplain

Critical Facilities	Type
At Home To Grow, LLC	Family Child Care Home II
Diana L Jacobsen	Family Child Care Home II
Kindercare Learning Center	Child Care Center
Nebraska State Penitentiary Hospital & Clinic	Nursing Home
Carpenter, Diana	Family Child Care Home I
Allder, Jo Ann	Family Child Care Home I
Toombs, Diane	Family Child Care Home I
Leyden, Carol	Family Child Care Home I
Pospisil, Patricia	Family Child Care Home I
Downs, Cyndee	Family Child Care Home I
Woolf, Twila	Family Child Care Home I

Critical Facilities	Type
Martinez, Dulce M.	Family Child Care Home I
Cherry, Melissa	Family Child Care Home I
Isley, Connie	Family Child Care Home I
Mcbride, Rebecca	Family Child Care Home I
Lincoln Christian School Preschool	Preschool
Prairieview Preschool	Preschool
Fire Station #3	Fire Department

Figure 164: Critical Facilities Map



TRANSPORTATION SYSTEM

Roadways

Today there are an estimated 2,808 miles of streets and highways serving the Lincoln. This includes approximately 30 miles of Interstate, 158 miles of U.S. and state Highways, 565 miles of major arterials and collector streets, and 2,055 miles of local streets. I80 has an NDOR traffic count of 43,450 motor vehicles and 7,300 heavy trucks daily**.**

Risk Assessment

HISTORICAL OCCURRENCES

The NCDC reported 99 severe weather events from 1996 to 2011. Due to the many events in the city, only those that resulted in property damages were selected and refer to the table below for detailed information of these selected severe weather events including date, extent, property damage, and crop damage. The reported events by each participant during the public meetings are listed in *Section Four: Risk Assessment* under each hazard section. The five hazards of most concern to Lincoln are: tornados, high winds, drought, severe winter storms, and severe thunderstorms.

Table 210: NCDC Severe Weather Events

Hazard	Date	Extent	Property Damage	Crop Damage
Flash Flood	8/14/1996		60.00K	0.00K
Lightning	5/8/1996		0.40K	0.00K
Lightning	5/8/1996		12.00K	0.00K
Lightning	5/14/1996		9.00K	0.00K
Lightning	7/10/1997		25.00K	0.00K
Lightning	8/19/2003		90.00K	0.00K
Lightning	5/29/2004		6.00K	0.00K
Lightning	8/8/2006		225.00K	0.00K
Thunderstorm Wind	4/8/1999	60 kts.	5.00K	0.00K
Thunderstorm Wind	8/14/1996	70 kts.	20.00K	0.00K
Thunderstorm Wind	6/20/1997		5.00K	0.00K
Thunderstorm Wind (Lincoln Airport)	5/22/1996	72 kts.	1.400M	0.00K

TORNADOS

The local planning team identified tornados as the top concern for the community. This is consistent for the entire planning area. According to the NCDC data there was one recorded tornado but no events were reported by the planning team.

The following information was reported by the Tornado History Project database:

- **June 6, 1971:** Two tornados hit the City of Lincoln causing a total of $6,000 in damage.
- **April 27, 1975:** A category F0 tornado in the City caused $25,000 in damage.
- **August 15, 1977:** A tornado in the City caused $25,000 in damage.
- **May 22, 2004:** An F4 touched down in Hallam that resulted in one death and $100 million in property damage.

The NCDC reports two tornadic events in Lincoln:

- **May 8, 1995:** A funnel cloud was reported.
- **May 22, 1996:** An F0 tornado was reported. Fortunately no injuries or monetary damages resulted.

Lancaster County's 2007 LEOP, reports three tornadic occurrences:

- **1957:** An F4 tornado damaged residential structures, there were no deaths or injuries reported.

- **1975:** An F4 tornado touched down in the northwestern portion of Lincoln. A significant amount of property damage was incurred, however there were no deaths or injuries reported.
- **1993:** A strong summer storm with 90 mph straight line winds spawned four small tornados that moved across Lincoln and the northern part of Lancaster County. There were thousands of trees destroyed and several millions of dollars in property damage.

No other historical occurrences in Lincoln were recorded by residents, city officials, or found in any other document.

HIGH WINDS

The local planning team identified high winds as a significant concern for the community. This is consistent for the entire planning area. According to the NCDC data there were 24 storm events which included strong winds (50+ kts) which could cause trees to uproot, considerable structure damage, and over turning of improperly anchored mobile homes. No other historical occurrences in Lincoln were recorded by residents, city officials, or found in any other document.

DROUGHT

The local planning team identified drought as a significant concern for the community. Drought is generally a regional event, with impacts from a single drought event impacting multiple communities, counties, and even states. For the community only a small percentage of the workforce relies on agricultural based income (0.8 for Lincoln). Due to the regional nature of drought and the low percentage of agricultural based incomes within the community drought will not be fully examined in this section. Please refer to *Section Four: Risk Assessment* for more information regarding the vulnerability of the entire planning region.

SEVERE WINTER STORMS

The local planning team identified severe winter storms as a significant concern for the community. This is consistent with the entire planning area. NCDC data records severe winter storms as "zonal" events meaning there is not a specific record of what communities are impacted or at least what the level impacts were per community.

The Lancaster County LEOP reports four separate severe winter storm occurrences for the City of Lincoln:

- **October 9, 1970**: The Columbus Day snowstorm dumped 6.6 inches of snow on the City causing extensive tree damage.
- **January 12, 1975:** The snowstorm referred to as "The Blizzard of the Century", produced 16 inches of snowfall that transpired over a 24 hour period. Both of Nebraska's metropolitan cities, Lincoln and Omaha, were brought to a standstill. Record low atmospheric pressures in the region were recorded, and strong winds created snow drifts reaching 15 feet.
- **1982:** An ice storm caused massive power outages. Nearly all of Lancaster County was impacted and some of the county residents were without power for three days.
- **January 26, 1994:** Freezing rain and sleet caused icing of trees and power lines. Some electrical outages also occurred. $50,000 worth of property damage was incurred.
- **September 22, 1995:** Record low temperatures from the lower 20s to the lower 30s put an end to an already stunted growing season across the Midlands. Nearly the entire state fell below 28 degrees. Hardest hit were the milo, soybean, and corn crops. Crop damages reported were $262 million.
- **October 25, 1997:** A rare winter storm brought 13 inches of wet, heavy, snow that weighed down and broke power lines and tree limbs. As a result, many residential areas and businesses were without power for several days and some areas for over a week. "Disaster areas" were declared and accrued over $50 million in public property damage. The cleanup was extensive, continuing well

into the following summer. The Lincoln Water System reported that they were without power at three critical pumping stations for several hours. The Lincoln Airport and West Lincoln business areas were two pressure districts affected by the storm.

The elderly may be more likely to sustain an injury or have a medical emergency as a result of shoveling snow following a winter storm. Community members and families below the poverty line are also as higher risk related to severe winter storms, as they may lack resources needed to sustain themselves through a major severe winter storm.

SEVERE THUNDERSTORMS

The local planning team identified severe thunderstorms as a significant concern for the community and expected that more than four severe thunderstorms would take place in the community in the next decade.

Lincoln has older housing stock and an aging population, both of which may lead to greater levels of vulnerability. Severe thunderstorms and hail can result in loss of electricity, blocked roadways, damages to trees, and flooding. Blocked roadways, as a result of downed threes, may also present life safety concerns to those needing immediate medical attention.

Damages to roofs and siding can result in significant losses for homeowners as well as business owners. CFs can also be damaged by hail events. NCDC reports 12 thunderstorm and lightning events that caused a total of $1,797,400 in property damages.

The Lincoln Journal Star reports:

- **August 1, 1981:** A 25 year storm hit, producing from 4.3 to 5.5 inches of rain in some areas.
- **September 25, 1981:** A storm producing three inches of rain in the southern and eastern part of the City caused two major power outages and six or seven smaller ones. The 911 call center reported receiving an estimated 150 phone calls regarding flooded basements.
- **June 22, 1981:** Hail, heavy rains, flooding, strong wind gusts and lightning damaged power lines, vehicles, and trees.

No other historical occurrences were reported by residents, village officials, or found in any other document.

EXTREME HEAT

The local planning team identified extreme heat as a significant concern for the community. This is consistent with the planning area. While there are no documented occurrences recently, via NCDC or other, it is understood that extreme heat is part of the local as well as regional climate. Extreme heat events are most likely to occur during June, July, and August.

Elderly residents, young children, and low-income families are all groups within the community which may be more vulnerable to the impacts of extreme heat events.

FLOODING

The local planning team identified flooding as a significant concern for the community. The NCDC reports three flash flood occurrences, one of which reported damages:

- **August 14, 1996:** $60,000 in reported property damage was caused by four inches of rain that produced a flash flood. Local businesses and homes were also damaged.

The following list of storms and information was provided by the Lancaster County LEOP:

- Salt Creek flooded 136 times between 1900 and 1952. Of these events, 22 were considered major.
- **May 8, 1950:** Salt Creek peaked at a height of 26.05 feet with a flow of 27,800 cfs. This occurred after 5.5 inches of rain fell in six hours and accumulated to 14 inches. 20,000 acres of land was flooded including 600 homes and 80 businesses. The total damage incurred amounted to $1,643,000 and nine deaths.
- **June 2, 1951:** Antelope Creek flooded. Water was waist deep at 28th and D streets, and one foot deep at 33rd and Normal. Salt Creek peaked at 26.15 feet with a flow of 28,200 cfs.
- **June 14, 1951:** Antelope Creek flooded. Eight inches of rain fell and caused $2,000,000 worth of damage. 92 businesses, 298 homes and the railroad were all damaged in the area.
- **June, 1952:** Another Antelope Creek flood occurred when 2.18 inches fell, causing $63,000 in damage.
- Between 1962 and 1993, a series of eight floods occurred on Salt Creek. The total amount of federal funds contributed was $668,800, with the largest lump sum contribution of $487,185 in 1993.
- **June 13, 1984:** Little Salt Creek flooded when three to four inches of rain caused the creek to peak at 16.20 feet and flow 7,500 cfs. The flood was classified as a 10-year flood.

The Lincoln Journal Star recounts the following flood events:

- **1892:** Extensive flooding drove 300 people from their homes.
- **1902:** Flooding left 1,000 residents homeless and caused 9 deaths
- **July 23, 1993:** Little Salt Creek peaked at 4 feet over flood stage. Lynn and Stevens Creek tributaries left their banks flooding streets, parking lots, businesses, and homes. The City received $823,997 from the Federal Emergency Management Agency for partial damage reimbursement. The total damage to public property was $2.9 million.
- **June 15, 1982:** Stevens Creek peaked at a height of 18.85 feet with a flow of 3,820 cfs. Up to five inches of rain blocked roads, threatened homes, and left cars stranded in high water. There was a police advisory encouraging Lincoln residents not to drive and at one point during the downpour, the police were instructed to park their cruisers unless they were needed somewhere. Lincoln Electric System reported several power outages, one of which was the result of flooded underground cables.
- **June 13, 1984:** Stevens Creek flooded with a peak of 19.57 feet and a flow of 4,620 cfs. The flood was classified as a 10-year flood and it claimed two lives when a car was swept off Highway 34.
- **July 4, 1984:** Water back log from Beal's Slough caused damage to local area businesses. One business reported damage of $4,000.
- **September 13, 1989:** Heavy rains caused $20,000 in damage to Lancaster County rock and gravel roads.
- **July 25, 1990:** Five inches of rain washed out roads, flooded basements, damaged businesses, and flooded parking lots.

Participants from the City of Lincoln recollected the following events:

- **March 1993:** The Lincoln Water System reports an ice jam on the Platte River that caused severe flooding along Salt Creek and Highway 6. The flood waters eroded embankments and exposed a 48-inch and 54-inch water transmission line from one of the Lincoln Water System's well fields. This exposure caused sections of the pipe line to break and float away.
- **July 24, 1993:** Flooding resulted when Lincoln received three times the normal amount of rain for July.

- **July 20, 1996:** Beal Slough flooded when over five inches of rain fell in south Lincoln over an 18 hour period. Flooding occurred on a number of roadways including Highway 2. Residential basements and recreational areas were flooded. Flooding also occurred near 33rd Street and Pioneers Boulevard as well as in many areas along the Tierra Branch in the Tierra, Williamsburg, Seven Oaks, and Cripple Creek Subdivisions. A similar incident occurred in 1989 when heavy rains filled and overtopped the creek. The waters spread to Tierra and Briarhurst Parks, and other nearby open spaces.

Participants also reported localized flooding at the following locations:

- 52nd and O St.
- Along Deadmans Run
- Cornhusker Hwy, particularly near N 14th St.
- 49th & Rentworth
- Old Cheney, near 7th Street
- 8th & Rentworth
- Fletcher, near N 57th St.

No other historical occurrences in Lincoln were recorded by residents, city officials, or found in any other document.

The following structures in the City of Lincoln are located within the 1% annual floodplain.

Table 211: Structural Inventory - Floodplain

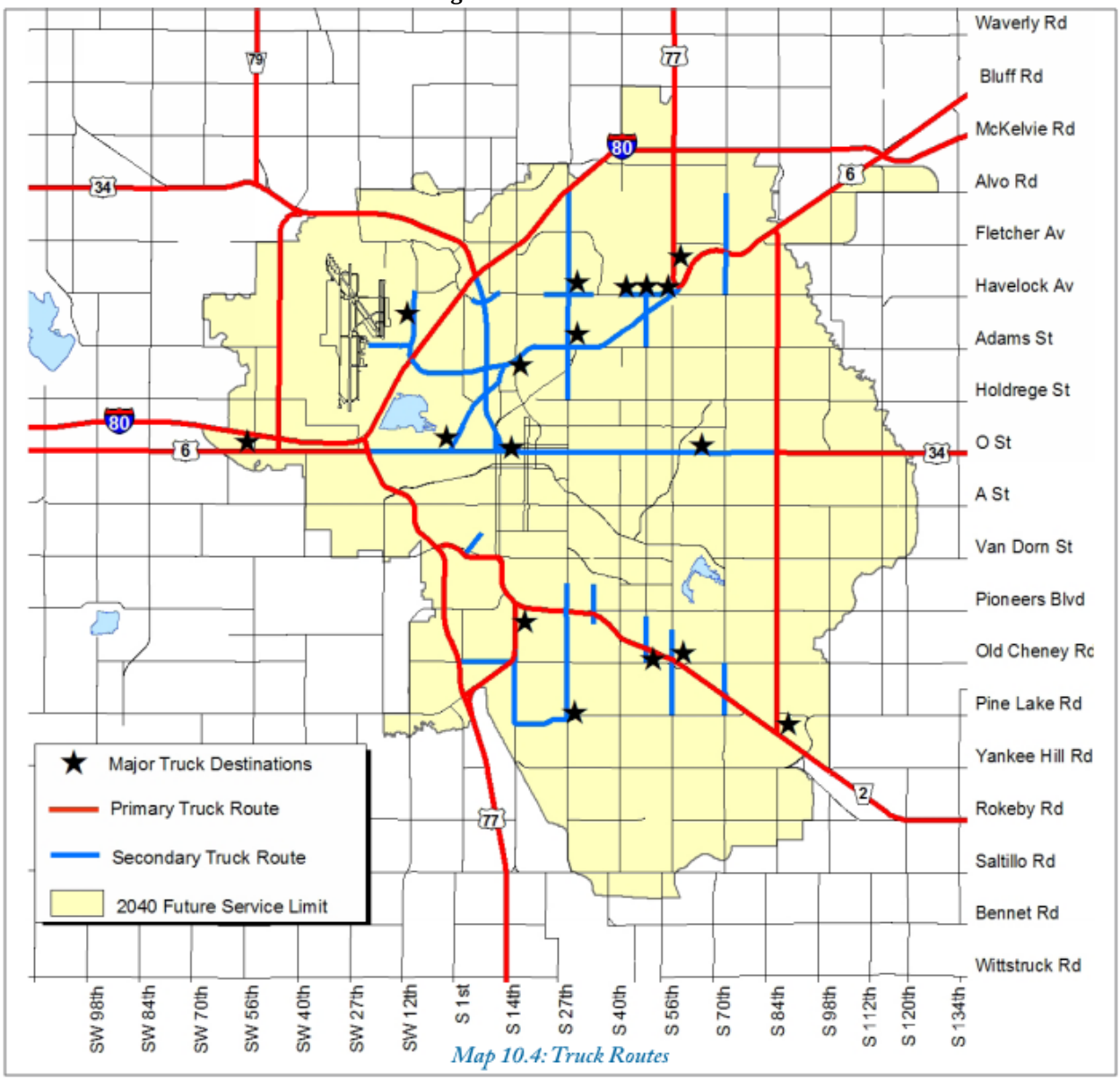
Structure Type	Number of Structures
Commercial/Industrial	7,355
Agricultural	70
Industrial	1,833
Residential	16,946
Other	10,332
Total	**36,536**

Lincoln also has one single family home on the NFIP repetitive loss list.

TRANSPORTATION

The following map, from the Comprehensive Map, illustrates existing truck routes.

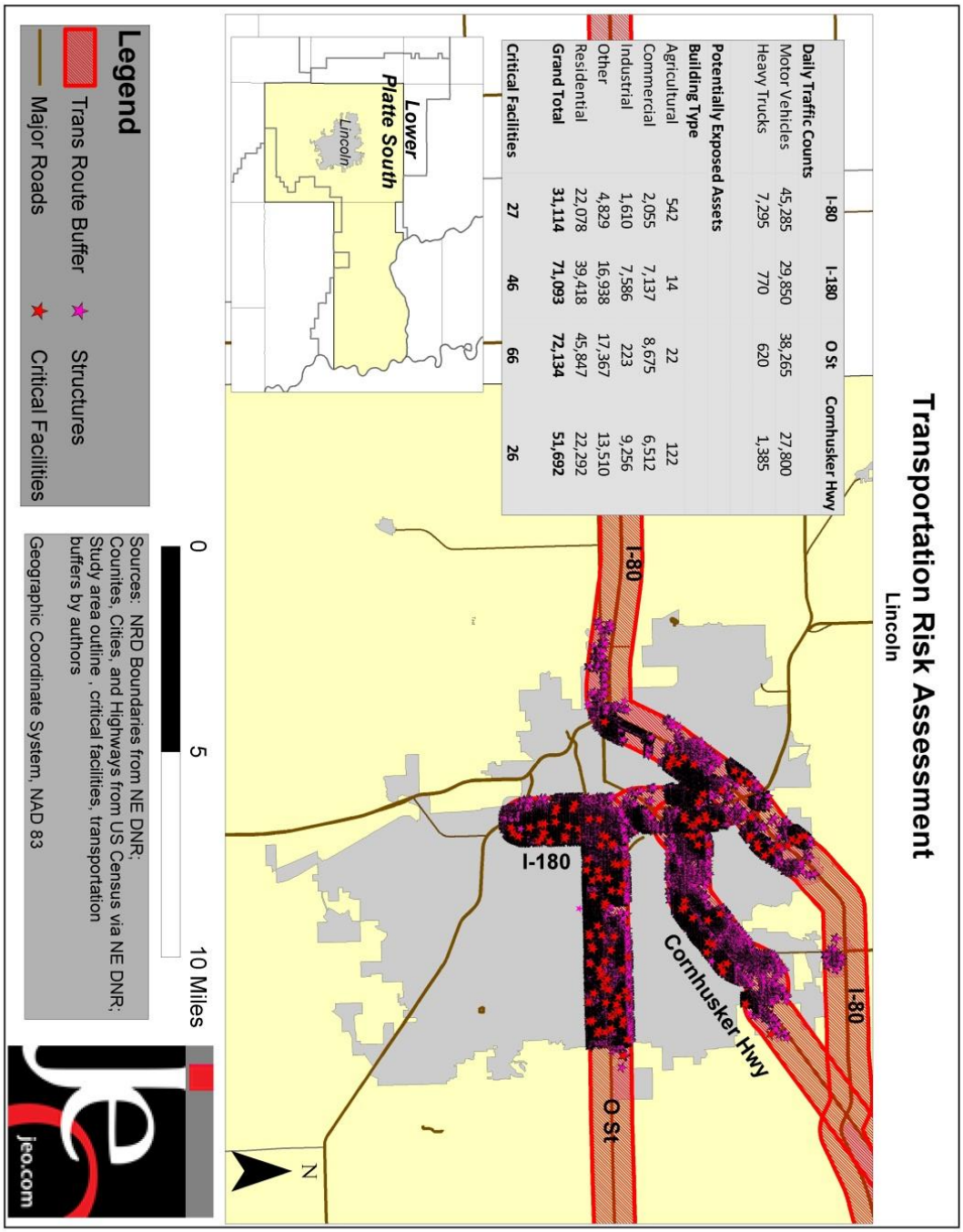
Figure 165: Truck Routes



CHEMICAL TRANSPORTATION

The following map illustrates all of the properties located within a ½ mile of the major chemical transportation routes which pass through Lincoln. Although any one event would not impact all of these structures, their proximity to the major transportation routes places them at greater risk. Any one event would impact a small subset of these structures, with the size of the impacted radius dependent upon the quantity and type of chemical spilled. All structures and CFs within the identified risk area should have shelter in place plans in place.

Figure 166: Transportation Risk

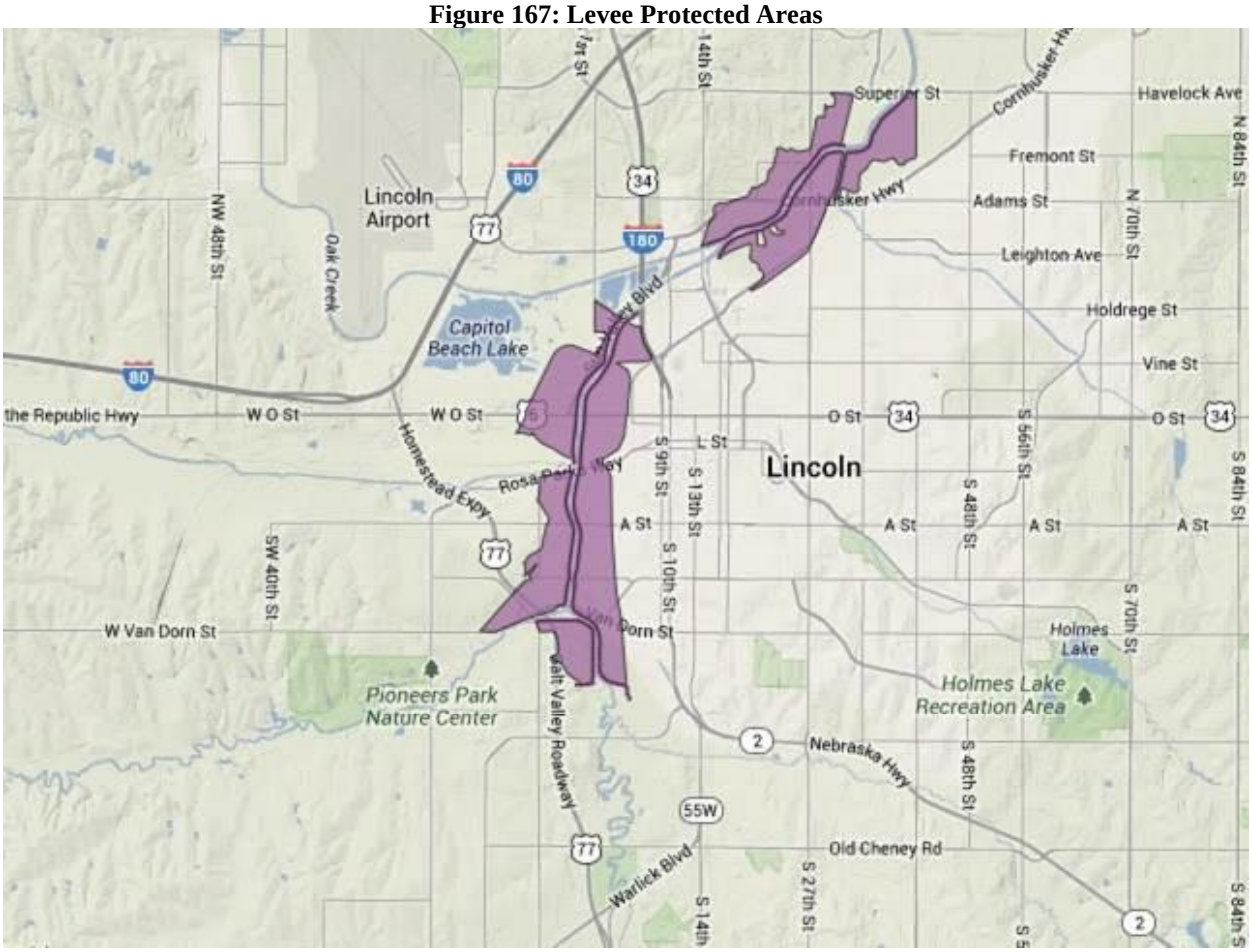


	I-80	I-180	O St	Cornhusker Hwy
Daily Traffic Counts				
Motor Vehicles	45,285	29,850	38,265	27,800
Heavy Trucks	7,295	770	620	1,385
Potentially Exposed Assets				
Building Type				
Agricultural	542	14	22	122
Commercial	2,055	7,137	8,675	6,512
Industrial	1,610	7,586	223	9,256
Other	4,829	16,938	17,367	13,510
Residential	22,078	39,418	45,847	22,292
Grand Total	**31,114**	**71,093**	**72,134**	**51,692**
Critical Facilities	**27**	**46**	**66**	**26**

LEVEE FAILURE

Although levee failure was not identified as a significant risk by the local planning team, there are urban areas of Lincoln which are protected by levees and therefore at risk in the event of a failure. The following map illustrates the levee protected areas.

Figure 167: Levee Protected Areas



Capability Assessment

The capability assessment consisted of two main components: a Capability Assessment Survey completed by the jurisdiction; and, a review of local existing policies, regulation, plans, and the programs. The survey serves to gather information regarding the jurisdiction's planning and regulatory capability; administrative and technical capability; fiscal capability; and education and outreach capability.

CAPABILITY ASSESSMENT SURVEY

- The city has five building inspectors and in addition a total of 22 various inspectors that inspect some part of buildings … Mechanical, Plumbing, Housing, Fire and Electrical inspectors. They inspect all new construction in some manner, but only the building inspector would inspect floodplain.
- Assorted codes are updated every three years. A task force for each trade reviews the current and proposed codes. The zoning code changes weekly, based on the changes proposed to City Council.
- Yes, they city charges fees for all parts of development.
- All of the inspectors can inspect for hazards, but it depends on the hazard. They are specialists trained in assorted fields.

- Funding for mitigation is minimal. Staffing is always on call.

Table 212: Capability Assessment

Survey Components/Subcomponents		Comments
Planning & Regulatory Capability	Comprehensive Plan	Yes
	Capital Improvements Plan	Yes
	Hazard Mitigation Plan	Yes
	Economic Development Plan	Yes (part of Comprehensive Plan)
	Emergency Operational Plan	Yes, Lancaster County
	National Resources Protection Plan	Yes (part of Comprehensive Plan)
	Floodplain Management Plan	Yes
	Storm Water Management Plan	Yes
	Zoning Ordinance	Yes
	Subdivision Regulation/Ordinance	Yes
	Floodplain Ordinance	Yes
	Building Codes	Yes (2009 IBC & local amendments)
	National Flood Insurance Program	Yes
	Community Rating System	No
	Well Head Protection Area/District	No
	Other (if any)	N/A
Administrative & Technical Capability	Planning Commission	Staff: 4
	Hazard Mitigation Planning Commission	No
	Floodplain Administration	Staff: 1
	Emergency Manager	Lancaster County
	GIS Coordinator	Staff: 3
	Chief Building Official	Staff: 5
	Civil Engineering	Staff: 4
	Staff Who Can Assess Community's Vulnerability to Hazards	Yes
	Grant Manager	Yes, at the department level
	Other (if any)	Urban Development Department
Fiscal Capability	Capital Improvement Project Funding	Yes
	Community Development Block Grant	Yes
	Authority to Levy Taxes for Specific Purposes	Yes
	Gas/Electric Service Fees	No
	Storm Water Service Fees	
	Water/Sewer Service Fees	Yes
	Development Impact Fees	Yes
	General Obligation Revenue or Special Tax Bonds	Yes
	Other (if any)	N/A
Education &	Local citizen groups or non-profit organizations focused on	

Survey Components/Subcomponents		Comments
Outreach Capability	environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes
Education & Outreach Capability	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes
	Natural Disaster or Safety related school programs	Yes
	StormReady Certification	No
	Firewise Communities Certification	No
	Tree City USA	Yes
	Public-private partnership initiatives addressing disaster-related issues	Yes
	Other (if any)	N/A

PLAN EVALUATION

The Lincoln/Lancaster Comprehensive Plan addresses the natural environment in many ways, under the umbrella of Environmental Stewardship and Sustainability. The plan addresses natural resource preservation through land use, as well as discussing the need to ensure community resilience in the face of natural disasters.

The results of applying the Safe Growth Audit (see *Section Six: Plan Implementation and Maintenance*) to evaluating the Lincoln/Lancaster County Comprehensive Plan 2040, the findings are demonstrated in the table below.

Table 213: Safe Growth Audit

Component		Items	I (Included)
Comprehensive Plan	Land Use	Identify hazard areas	I
		Land-use policy that discourages (re)development within hazard areas	I
		Provide adequate area for growth outside hazard areas	I
	Transportation	Limit access to hazard areas	
		Policy that guides growth outside hazard areas	
		Emergency functional designs	
	Environmental Management	Identify and map environmental systems that protect development from hazards	
		Policy that maintains and restore protective ecosystems	I
		Policy that provides incentives to developments outside protective ecosystems	
	Public Safety	Goals and policies are related to hazard plan	I

Component		Items	I (Included)
		Plan's growth and development policies that explicitly include safety	I
		Monitoring and implementation section cover safe growth objectives	
Zoning Ordinance		Discouraging (re)development within hazard areas	I
		Contain natural hazard overlay zones that set conditions for land use within such zones	
		Recognize hazard areas as limits in rezoning procedures	
		Prohibit development within, or filling of, wetlands, floodways, and floodplains	I
Subdivision Regulation		Restrict the subdivision of land within or adjacent to hazard areas	I
		Conservation subdivisions or cluster subdivisions to conserve environmental resources	
		Allow density transfers where hazard areas exist	

Mitigation Strategy

Completed Projects:

ACTION 2.1.21	Project at Beal Slough at 14th Street
Analysis	Near 14th Street to decrease flood elevations by implementing a package of conveyance improvements. Improvements near 14th Street to include construction of a diversion channel around a BNSF Railway spur track, channel improvements to Beal Slough, and replacement of the existing 14th Street bridge to increase conveyance capacity. (Preliminary Flood Reduction Study, Beal Slough - Pioneers Boulevard to Southwood Drive, July 26, 2006)
Goal/Objective	Goal 2/Objective 2.1
Hazard(s) Address	Flooding
Status/Notes	Completed; This project was a collaborative effort between the NRD & City funded with help from HMGP

ACTION 2.1.22	Flood Reduction at Antelope Creek
Analysis	Flood reduction project along Antelope Creek from 40th Street downstream through 27th Street. This project involves widening 1,450 feet of the channel with a "lower shelf" on the left bank, reconstruction of the existing bike trail, installation of 2 box culverts at the "A" Street crossing, and creation of a dry detention cell in Antelope Park. (Preliminary Flood Reduction Study, Antelope Creek, South 27th Street to South 56th Street, Lincoln, Nebraska, Alternative 4 p. 32)
Goal/Objective	Goal 2/Objective 2.1
Hazard(s) Address	Flooding
Status/Notes	Completed

ACTION 2.1.23	Antelope Creek Project Near A Street
Analysis	Antelope Creek project near A Street. This project would add two box culverts at A Street bridge, realign the Billy Wolfe bicycle trail, and improve the channel for 1450 linear feet downstream. (Preliminary Flood Reduction Study, Antelope Creek, South 27th Street to South 56th Streets, section 3.1)
Goal/Objective	Goal 2/Objective 2.1
Hazard(s) Address	Flooding
Status/Notes	Completed

ACTION 2.1.24	Antelope Creek Dry Detention Project

Analysis	Antelope Creek Dry Detention Project in Antelope Park to reduce flooding by adding a 2.2 acre detention cell to temporarily store a portion of the flow from a tributary to Antelope Creek. (Preliminary Flood Reduction Study, Antelope Creek, South 27th Street to South 56th Streets, section 3.3)
Goal/Objective	Goal 2/Objective 2.1
Hazard(s) Address	Flooding
Status/Notes	Completed

ACTION 2.1.30	**Storm Water Detention at Taylor Park Near 66th**
Analysis	Stormwater detention project in Taylor Park near 66th and Taylor Park Drive. This project would enhance the functionality of the park using walking trails and trees. (DMR Master Plan 8.4.2.2)
Goal/Objective	Goal 2/Objective 2.1
Hazard(s) Address	Flooding
Status/Notes	Completed

ACTION 2.1.50	**Central Utility Plant at Department of Corrections**
Analysis	At the Central utility plant at the department of corrections, where power comes in at, build a floodwall around the facility and build flood gates
Goal/Objective	Goal 2/Objective 2.1
Hazard(s) Address	Flooding
Status/Notes	Completed; This project was a collaborative effort between the NRD & City funded with help from HMGP

NEW OR PREVIOUSLY IDENTIFIED MITIGATION ACTIONS

The following hazard mitigation actions were ranked high by the City Lincoln, or were noted as being underway since the previous hazard mitigation plan.

Improve Drainage

Description: Improve the drainage at 11th Street and Harrison Ave.
Hazard(s) Addressed: Flooding
Estimated Cost: $1,318,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Engineering Department
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage from at 33rd and Holdrege Streets
Hazard(s) Addressed: Flooding
Estimated Cost: $471,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Engineering Department
Status: Not Yet Started

NFIP Repetitive Loss Structure Removal/Acquisition

Description: Implement projects such as property acquisition, relocation, demolition, or elevation of the one existing repetitive loss structure located in the City/Village
Hazard(s) Addressed: Flooding
Estimated Cost: Dependent upon market value of the structure
Potential Funding: HMGP, PDM, Flood Mitigation Assistance, LPSNRD, Governing County & Local Governing Agency
Timeline: Ongoing
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division), Lower Platte South NRD
Status: No structures have been acquired in the last five years.

Stormwater System and Drainage Improvements

Description: Lincoln utilizes a stormwater system comprised of pipes and inlets as well as ditches and culverts. Stormwater system improvements may include pipe upsizing and additional inlets. Retention and detention facilities may also be implemented to decrease runoff rates while also decreasing the need for other stormwater system improvements. Other improvements may include ditch upsizing, ditch cleanout and culvert improvements. These improvements can serve to more effectively convey runoff within city, preventing interior localized flooding.
Hazard(s) Addressed: Flooding
Estimated Cost: $100,000+
Potential Funding: HMGP, PDM, CDBG, City of Lincoln Public Works, LPSNRD, & Lancaster County
Timeline: Ongoing
Priority: Medium
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: In the past 5 years, the City has spent approximately $10 million on various Storm Water Bond projects to improve the capacity of inlets, ditches, and storm sewer pipes

Flood Reductions within the Deadman's Run Watershed

Description: Implement projects identified in the Deadman's Run Watershed Master plan developed by the City and NRD to address basin wide flooding concerns, stream erosion problems and improve water quality. The master plan identified more than dozen Capital Improvement Projects (CIP) with the estimated cost of $50 Million. These CIP projects include channel widening, bridge upgrade, detention ponds and stream stabilization project. City plans to implement the CIP projects identified in these plans.
Hazard(s) Addressed: Flooding
Estimated Cost: $50,000,000
Potential Funding: HMGP, PDM, CDBG, City of Lincoln, LPSNRD, Lancaster County
Timeline: 1 to 5 years
Priority: Medium
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Currently being evaluated for alternatives

Storm Shelter / Safe Rooms

Description: Design and construct storm shelters and safe rooms in highly vulnerable areas such as mobile home parks, campgrounds, school, and other areas.
Hazard(s) Addressed: Tornados and high winds, severe thunderstorms
Estimated Cost: $200-$300/sf stand alone; $150-200/sf addition/retrofit
Potential Funding: PDM, HMGP, City of Lincoln, Lancaster County, LPSNRD
Timeline: Ongoing
Priority: High
Lead Agency: City of Lincoln, Lincoln/Lancaster County Emergency Management
Status: Local officials and stakeholders have met to discuss the feasibility of safe room installation in critical facilities and near vulnerable populations

Middle Creek Project

Description: Middle Creek flood control project to reduce peak flow from Middle Creek to lower flooding level in Salt Creek. Flooding from Salt Creek threatens several hundred homes and businesses in Lincoln including the downtown area.
Hazard(s) Addressed: Flooding
Estimated Cost: $15,400,000
Potential Funding: PDM, HMGP, Lincoln, State of Nebraska, LPSNRD
Timeline: Consideration pending the availability of future funding
Priority: Medium
Lead Agency: City of Lincoln Dept of Public Works (Watershed Management), LPSNRD
Status: Not yet started

Oak Creek Project

Description: Oak Creek flood control project to reduce peak flow from Oak Creek. This will reduce flooding in Oak Creek and the adjacent airport as well as lower flooding levels in Salt Creek. Flooding from Salt Creek threatens several hundred homes and businesses in Lincoln including the downtown area.
Hazard(s) Addressed: Flooding
Estimated Cost: $23,200,000
Potential Funding: PDM, HMGP, Lincoln, State of Nebraska, LPSNRD, NEMA
Timeline: Consideration pending the availability of future funding
Priority: Medium
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division), LPSNRD
Status: Not yet started

Oak Creek Flood Control

Description: Oak Creek flood control protection. This project is to increase the protection level of a non-certified levee for the airport and nearby National Guard base. This is associated with the Oak Creek Flood Control Project.
Hazard(s) Addressed: Flooding
Estimated Cost: $6,000,000
Potential Funding: PDM, HMGP, Lincoln, State of Nebraska, LPSNRD, NEMA
Timeline: Consideration pending the availability of future funding
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division), LPSNRD
Status: Not yet started

Emergency Power Contingency Plan

Description: Development and implementation of an Emergency Power Contingency Plan for the Lincoln Water System. (A comprehensive study and installation of back-up power at critical locations. This will provide the ability to remain operational for minimum water demands and fire suppression in the City of Lincoln.)
Hazard(s) Addressed: Severe Thunderstorm, Severe Winter Storm, Flooding, Drought, and Extreme Heat
Estimated Cost: Not yet available
Potential Funding: PDM, HMGP, Lincoln, State of Nebraska, LPSNRD, NEMA
Timeline: 2 years
Priority: Very High
Lead Agency: City of Lincoln Department of Public Works (Lincoln Water System)
Status: Not yet started

Maintain Good Standing in the Community Rating System (CRS)

Description: Maintain good standing as a CRS community. Furthermore, work to gain better status and further lower flood insurance premiums
Hazard(s) Addressed: Flooding
Estimated Cost: $0
Potential Funding: City of Lincoln
Timeline: On-going
Priority: Medium
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Lincoln is currently a Class 5 in the CRS program

National Flood Insurance Program (NFIP)

Description: Maintain good standing with National Flood Insurance Program (NFIP)
Hazard(s) Addressed: Flooding
Estimated Cost: N/A
Potential Funding: N/A
Timeline: Ongoing
Priority: High
Lead Agency: City of Lincoln Department of Building & Safety
Status: Lincoln is still participating in the NFIP

Civil Service Improvements

Description: Improve Fire Department and Rescue squad equipment and facilities. Providing additional, or updating existing emergency response equipment; this could include fire trucks, ATV's, motor boats, etc. This would also include developing backup systems for emergency vehicles, and identifying and training additional personnel for emergency response.
Hazard(s) Addressed: All Hazards
Estimated Cost: $5,000 to $400,000 per vehicle, varies depending on what equipment is needed
Potential Funding: HMGP, City of Lincoln, Lancaster County, & LPS NRD
Timeline: On-going
Priority: Low
Lead Agency: City of Lincoln, Lancaster County, Lincoln/Lancaster Emergency Management Agency
Status: Improvements to response and recovery capabilities are ongoing. New resources are purchased as the need is identified and funds are available.

Improve and Revise Snow / Ice Removal Program

Description: As needed, continue to revise and improve the snow and ice removal program for streets. Revisions should address situations such as plowing snow, ice removal, parking during snow and ice removal, and removal of associated storm debris. Actions under this item should improve the capabilities to rescue those stranded in blizzards and increase the capacity in which snow can be removed from roadways after an event.
Hazard(s) Addressed: Severe Winter Storm
Estimated Cost: $20,000 +
Potential Funding: HMGP, City of Lincoln, Lancaster County, LPS NRD
Timeline: On-going
Priority: Low
Lead Agency: City of Lincoln Department of Public Works, LPSNRD, Lancaster County
Status: In 2014 Public Works revised the Winter Operations Plan; Implementations of Anti-Ice Brine production process for emergency snow routes, bridges, intersections, and other arterials.

Weather Radios

Description: Conduct an inventory of weather radios at schools and other critical facilities and provide new radios as needed.
Hazard(s) Addressed: All hazards
Estimated Cost: $50/per radio
Potential Funding: HMGP, PDM, City of Lincoln, Lancaster County, LPS NRD
Timeline: On-going
Priority: High
Lead Agency: City of Lincoln, Lancaster County, Lincoln/Lancaster County Emergency Management
Status: Weather radios have been placed in all Lincoln Public Schools School. Lincoln/Lancaster County EMA continues to work with stakeholders and local agencies to identify areas of need and make recommendations to install weather radios. Lincoln/Lancaster County EMA has assisted in the purchase of weather radios as needed. In 2014 Lincoln/Lancaster County EMA assisted in the installation of 10 weather radios for local government and local nonprofit agencies

Improve Drainage

Description: Improve the drainage on 24th Street from E St. to Antelope Creek
Hazard(s) Addressed: Flooding
Estimated Cost: $462,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage on 33rd Street from Holdrege St. to Baldwin Ave.
Hazard(s) Addressed: Flooding
Estimated Cost: $3,637,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage at 63rd and Aylesworth Ave.
Hazard(s) Addressed: Flooding
Estimated Cost: $531,200
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage from 40th and J Streets to 37th and M Streets
Hazard(s) Addressed: Flooding
Estimated Cost: $1,690,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage at Cotner Blvd and Baldwin Ave.
Hazard(s) Addressed: Flooding
Estimated Cost: $410,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage at N 68th St. between Fremont St and Seward St
Hazard(s) Addressed: Flooding
Estimated Cost: $733,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage south of Lowell Ave. between 46th and 47th Streets
Hazard(s) Addressed: Flooding
Estimated Cost: $36,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage at North of Madison Ave, east of 33rd St
Hazard(s) Addressed: Flooding
Estimated Cost: $23,000
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Improve Drainage

Description: Improve the drainage at Forest Lake Blvd
Hazard(s) Addressed: Flooding
Estimated Cost: $84,100
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Watershed Management Division)
Status: Not Yet Started

Bank Stabilization

Description: Implement river bank stabilization measures for city owned property along the Platte River. Current erosion pattern will impact the ability to develop that area for wells to meet future production demands.
Hazard(s) Addressed: Flooding
Estimated Cost: Not yet available
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Lincoln Water System)
Status: In Progress

Emergency Generator Service Provider Agreement

Description: Development and implementation of a service agreement to provide emergency back-up generators. These generators would be necessary to provide power for operations to provide fire suppression and minimum water demands for the City of Lincoln.
Hazard(s) Addressed: All Hazards
Estimated Cost: Not yet available
Potential Funding: City of Lincoln
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Lincoln Water System)
Status: In Progress

Capability to Connect To Portable Generators to Operate City Vehicle Fuel Sites

Description: Conduct a comprehensive study of remote city vehicle fueling sites to identify electrical components required for utilization of portable back-up generators. Project would also include installation of those components, generators to be provided by local emergency management or contractual services.
Hazard(s) Addressed: All Hazards
Estimated Cost: Not yet available
Potential Funding: HMGP, City of Lincoln, NEMA
Timeline: 3 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works
Status: In Progress

Inflow and Infiltration Reduction Program

Description: Develop and implement a program to reduce inflow and infiltration of stormwater into the wastewater collection system.
Hazard(s) Addressed: Flooding
Estimated Cost: $500,000
Potential Funding: PDM, HMGP, CDBG, City of Lincoln
Timeline: December 2016
Priority: High
Lead Agency: City of Lincoln Department of Public works
Status: Scope of work being developed

Re-Routing of Sump Pump Discharge

Description: Develop and implement a program to inspect piping and routing of sump pump discharge. This may include a cost share program to assist homeowner in this effort. Estimate 20,000 homes at 1c000 each and 50-50 cost share.
Hazard(s) Addressed: Flooding
Estimated Cost: 250,000 to develop program, 500,000 yearly for cost share
Potential Funding: City of Lincoln
Timeline: 18 months to develop program, 20 years to implement
Priority: Medium
Lead Agency: City of Lincoln Department of Public works
Status: Not yet started, concept being evaluated.

Service Line Inspection Program

Description: Develop and implement a program inspect wastewater service lines and prioritize lines in need of repair. This program would reduce ground water infiltration into the wastewater system and reduce impacts during flood and high water events. Estimate 10,000 homes at 5,000 ea.
Hazard(s) Addressed: Flooding
Estimated Cost: 250,000 to develop program, 1,000,000 yearly
Potential Funding: City of Lincoln
Timeline: 18 months to develop program, 50 years to implement
Priority: Medium
Lead Agency: City of Lincoln Department of Public works
Status: Not yet started, concept being evaluated.

Wastewater Collection System Monitoring

Description: Improve/expand monitoring capabilities of the wastewater collection system for the city.
Hazard(s) Addressed: Flooding
Estimated Cost: $300,000
Potential Funding: City of Lincoln
Timeline: December of 2016
Priority: High
Lead Agency: City of Lincoln Department of Public works
Status: Scope of work being developed

Back-Flow Preventer Cost Share Program

Description: Establish a cost share program to assist home owners in vulnerable areas in the installation of backflow preventers on wastewater service lines. This would prevent wastewater from backing up into structures during flooding and high water events. Install in 200 houses at 5,000 each
Hazard(s) Addressed: Flooding
Estimated Cost: 25,000 to develop program, 1,000,000 to implement
Potential Funding: City of Lincoln
Timeline: December of 2017
Priority: Medium
Lead Agency: City of Lincoln Department of Public works
Status: Not yet started, concept being evaluated.

Develop Emergency Action Plans

Description: Develop emergency action plans for service divisions of Lincoln's Public Works Department. These plan would outline the response protocol employed during emergency events.
Hazard(s) Addressed: Flooding
Estimated Cost: $10,000 - $30,000 per service division (seven total divisions)
Potential Funding: City of Lincoln, Lancaster County
Timeline: 3 years
Priority: Medium
Lead Agency: City of Lincoln Department of Public works
Status: In progress

Channel Improvement

Description: Channel improvements project to correct the effects of channel constrictions near Cornhusker Highway. This project would involve 3 separate locations where the constriction of flow will be alleviated by increasing the width or the stream channel, creating a two stage channel which allows the smaller stream forming flow to meander within the larger flood channel. Other improvements would be to replace crossing structures with larger capacity structures. (DMR Master Plan, Section 8.4.1.1)
Hazard(s) Addressed: Flooding
Estimated Cost: $8,304,000
Potential Funding: HMGP, PDM, FMA, City of Lincoln, LPS NRD
Timeline: Consideration pending the availability of funding
Priority: High
Lead Agency: City of Lincoln Public Works
Status: Not yet started

56th Street and Morton Channel Improvements

Description: The area of 56th Street/HWY 77, between Cornhusker and HWY 80 has a history of flooding, with numerous properties subject to damage. The City is pursing channel and crossing improvements in the northern reaches of the area to increase channel capacity and reduce flood depths.
Hazard(s) Addressed: Flooding
Estimated Cost: $3,260,000
Potential Funding: HMGP, City of Lincoln
Timeline: 5 years
Priority: High
Lead Agency: City of Lincoln Public Works
Status: Pending funding

Improve Drainage

Description: Project on N. 56th Street ditch in the vicinity of Fletcher Street. Adjacent business have been flooded two times (7/10/03 & 6/18/08)
Hazard(s) Addressed: Flooding
Estimated Cost: $1,000,000
Potential Funding: HMGP, PDM, City of Lincoln, LPS NRD
Timeline: Consideration pending the availability of funding
Priority: High
Lead Agency: City of Lincoln Public Works
Status: Not yet started

Tree City USA

Description: Maintain participation in the Tree City USA program.
Hazard(s) Addressed: Tornado, Severe Thunderstorms, Severe Winter Storms
Estimated Cost: $517,000 for tree care program
Potential Funding: City of Lincoln
Timeline: Ongoing
Priority: Medium
Lead Agency: City of Lincoln Parks and Recreation
Status: Lincoln has participated in the program for 38 years

Emergency Electrical Generator for Wastewater Treatment Plant

Description: Installation of emergency electrical generators at the Theresa Street Wastewater Treatment Plant to provide emergency backup power for wastewater treatment.
Hazard(s) Addressed: Flooding
Estimated Cost: $250,000 design, $1,008,000 construction
Potential Funding: HMGP, PDM, City of Lincoln, Lancaster County, State of Nebraska
Timeline: Timeline is currently under review
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Waste Water)
Status: Scope of Services for an Emergency Preparedness Study for the City of Lincoln Department of Public Works & Utilities was prepared in 2014 and is under review

Levee at Theresa Street

Description: Installation of a levee around the Theresa Street Waste Water Treatment Plant to protect it from flooding from Salt Creek**.**
Hazard(s) Addressed: Flooding
Estimated Cost: $250,000 design, $1,008,000 construction
Potential Funding: City of Lincoln, Lancaster County
Timeline: 5 years
Priority: High
Lead Agency: City of Lincoln Department of Public Works (Waste Water)
Status: Not yet started

Complete a City Wide Master Plan to Prioritize All Flooding Related Projects

Description: Stormwater master plans can be conducted to perform a community-wide stormwater evaluation, identifying multiple problem areas, and potentially multiple drainage improvements for each.
Hazard(s) Addressed: Flooding
Estimated Cost: $200,000 - $300,000 per Basin or update
Potential Funding: City of Lincoln, Lancaster County, LPS NRD
Timeline: On-going
Priority: High
Lead Agency: City, NRD
Status: The City has completed plans examining different Watershed Basins within the city in recent years. Studies include (but are not limited to): Antelope Creek Basin Master Plan, Beal Slough Master Plan, Cardwell Master Plan, Deadman's Run Watershed Study, Haines Branch Master Plan, Little Salt Creek Master Plan, Middle Creek Master Plan, South Salt Creek Master Plan, Southeast Upper Salt Creek Master Plan, and Stevens Creek Master Plan)

Preserve Natural and Beneficial Functions

Description: Preserve natural and beneficial functions of floodplain land through measures such as: retaining natural vegetation, restoring streambeds, and preserving open space in the floodplain.
Hazard(s) Addressed: Flooding
Estimated Cost: $100,000 - $200,000 annually
Potential Funding: PDM, HMGP, CDBG, City of Lincoln, Lancaster County & LPSNRD
Timeline: On-Going
Priority: High
Lead Agency: City of Lincoln Public Works
Status: Have assisted in the purchase of several properties within the floodplain of Haines Branch

Adopt a No Adverse Impact approach to floodplain management

Description: Adopt a No Adverse Impact approach to floodplain management
Hazard(s) Addressed: Flooding
Estimated Cost: $0
Potential Funding: N/A
Timeline: On-Going
Priority: High
Lead Agency: City of Lincoln Public Works
Status: Program On-Going

Utilize low impact development practices and green infrastructure to reduce flood risk

Description: Low impact development practices and green infrastructure can reduce runoff and result in a reduction in stormwater related flooding
Hazard(s) Addressed: Flooding
Estimated Cost: Varies
Potential Funding: City of Lincoln, Lancaster County & LPS NRD
Timeline: Ongoing: Community will implement projects as they are identified
Priority: High
Lead Agency: City of Lincoln Public Works
Status: Program On-going; City adopted Water Quality Standards which go into effect 2/2016

APPENDICES

Appendix A – Adoption Letters and Resolutions
Appendix B – Documents of Public Involvement
Appendix C – Public Meeting Materials and Worksheets
Appendix D – Worksheets to Assist Community in Review and Updates
Appendix E – Stakeholder Groups
Appendix F – Hazard Mitigation Project Funding Guidebook

Appendix A – Adoption Letters and Resolutions

Contains the following:

1. Adoption Letter
2. Resolutions

Appendix B – Documents of Public Involvement

Contains the following:

1. Letters
2. Sign-in Sheets

Meeting Reminder

May 2, 2013

RE: Lower Platte South Natural Resources District (NRD) Multi-jurisdictional Hazard Mitigation Plan (HMP) Update

Dear Hazard Mitigation Planning Participant:

The NRD has secured grant funding from the Federal Emergency Management Agency (FEMA) and is in the process of updating the district-wide HMP with assistance from JEO Consulting Group, Inc of Lincoln, NE. Federal legislation requires HMPs be updated every five years. **You are receiving this letter because your jurisdiction is eligible and encouraged to participate in this planning effort, which has multiple benefits for your community.**

A hazard mitigation plan identifies the vulnerability of a jurisdiction to various natural hazards (flood, drought, earthquake, wildfire, winter storm, etc.) and assesses the potential losses associated with each hazard. In addition, the plan identifies mitigation alternatives to decrease the threat from identified hazards and establishes a prioritized list of these mitigation projects. Hazard mitigation plans are a requirement of the Disaster Mitigation Act of 2000, administered by FEMA, and once a community is part of a plan, they become eligible to apply for FEMA hazard mitigation grants. These grants can be used for up to a 75% cost share for a wide variety of projects listed in the plan. Other funding opportunities will also be explored.

As a FEMA requirement, to be included as part of the plan, at least one 'designated representative' from your jurisdiction must be present at one of the upcoming public meetings. The 'Hazard Identification' Meetings will be held:
May 16, 2013 at 5:30 PM at the LPSNRD Office – 3125 Portia St, Lincoln; and
May 30, 2013 at 7:00 PM at Weeping Water City Hall - 101 West Eldora Avenue, Weeping Water

We highly encourage you to participate in this project. Following the Hazard Identification Meeting on May 16, please visit the project participation website: www.hazardtalk.com to continue your community's role in the plan update. For further information or to review the current Hazard Mitigation Plan, please visit; www.lpsnrd.org/HazardPlan.pdf

If your jurisdiction (city, village, county, school district, etc.) is interested in participating in this effort, please designate a representative for your jurisdiction and contact me at 402.476.2729 or pzillig@lpsnrd.org.

Sincerely,

Paul Zillig
NRD Assistant General Manager

CC: Jeff Ray, JEO Consulting Group, Inc.

November 4, 2013

RE: LPSNRD Multi-Jurisdiction Hazard Mitigation Plan
Mitigation Alternative Public Meetings 2-Week Notice Letter

Dear Hazard Mitigation Planning Participant:

The LPSNRD is continuing the development of the multi-jurisdictional Hazard Mitigation Plan with the 'Mitigation Strategies' public meetings. ***Your jurisdiction's attendance is required in order to continue participation in this planning effort!*** The intent of these meetings is to gather and review vital information from individual plan participants including:

1) Review of Mitigation Alternatives Identified in the 2008 HMP
2) Review of 'first draft' of the LPSNRD Plan
3) Identify, Evaluate, and Prioritize mitigation projects and strategies
4) Identify and Obtain missing sources of information and data
5) Finalize review of 'critical facilities' for your community
6) Identify highly vulnerable places and populations
7) Discuss the upcoming Capabilities Assessment Survey

Continued participation in the planning effort makes your jurisdiction eligible for pre-hazard mitigation project cost-share. Potential project examples include: drainage improvements, improved storm water infrastructure, safe rooms, back-up power generation, emergency warning/notification equipment and a number of other possible mitigation activities. Prior to this letter you received a summary of FEMA's Publication: *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazard;* this publication has valuable information that could prove useful at the following meetings. If you need or would like another copy of this document please contact Jeff Henson with JEO at jhenson@jeo.com.

Please be advised that in order to continue being included as part of the plan, at least one 'designated representative' from your jurisdiction must be present at one of the following public meetings:

- **November 19, 2013 at 7:00 pm: LPSNRD Office – 3125 Portia St., Lincoln; and**
- **November 21, 2013 at 7:00 pm: Weeping Water City Hall – 101 West Eldora Ave., Weeping Water**

We look forward to seeing you at the upcoming meetings, if you have questions or to RSVP for a meeting please contact me at 402.476.2729 or pzillig@lpsnrd.org.

Sincerely,

Paul Zillig
NRD Assistant General Manager

CC: Jeff Ray, JEO Consulting Group, Inc.

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
Planning Team Meeting #1
Lincoln, NE – Thursday, May 16, 2013; 3:30 PM
PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
MARK ROBERTSON	PREPAREDNESS COORD.	UNL	300 N 17TH, LINCOLN 68588	402 472 7632	mrobertson5@unl.edu
Matt Roy	Planner	JEO	650 J. St. Lincoln, 68506	402-474-7885	mroque@jeo.com
Alessandra Jerolleman	Mitigation Planner	JEO			
PAUL ZILLIG	LPSNRD	LPSNRD	YES	402 476 2729	pzillig@lpsnrd.org
Brock Thompson	Planning Intern	JEO		402 618 5279	brockthompson13@gmail.com
JEFF RAY	DEPT. MANAGER JEO	JEO		402 779 1070	JRAY@JEO.COM
ED UBBEN	PROJECTS COORDINATOR	LPSNRD	3125 PORTIA LINCOLN	402-476-2729	eubben@lpsnrd.org
Adam Rupe	Environmental Planner	JEO	—	402.474.8760	arupe@jeo.com
Lalit Jha	Project Manager	JEO		402-443-8010	ljha@jeo.com
Jared Nelson	Engineer	? Lincoln	555 S. 10th St, Lincoln	402-441-4955	jlnelson@lincoln.ne.gov
BILL EDWARDS					
John Callen	Engineer	NDNR	301 Centennial Mall South	(402) 471-3957	John.callen@nebraska.gov
Sara Hartzell	Planner	? Linc. / Lanc. Co.	555 S. 10th St Suite 213	402-441-6371	shartzell@lincoln.ne.gov

Please Sign In!

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
"Hazard ID Public Meeting"
Lincoln, NE – Thursday, May 16, 2013, 5:30 PM
PLEASE PRINT CLEARLY- THANK YOU!

JEO CONSULTING GROUP INC

NAME	TITLE	JURISDICTION Represented	Official Designated Representative for this Jurisdiction?	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
Doug Ahlberg	Director	Lancaster	Lancaster Co	233 So. 10th Linc. NE	402-441-7441	dahlberg@lancaster.ne.gov
Bill Edwards		Denton	yes			
Bryan Kubicek	Board Member	Davey	yes	3510 Maple	402 785-9206	
Jarred Meyer	Village Board	Firth	yes	706 Nemaha St., Firth NE 68358	402-792-5783	meyer.jarred@gmail.com
David Moll	Chairman	Greenwood	YES	609 Main St Greenwood	402-789-2310	David.moll@ers.gov
Bill Jones	FP.M. Spec.	? State		301 Cent. Mall S	402. 471.3932	bill.jones@nebraska.gov
Daren Konda	Civil Engineer	SID 1 Lake Wanahoo	402-604-9173	10836 Old Mill Road Omaha NE 68154	402-330-8860	dkonda@TDZCO.com TDZCO.com
Chad Lyon	Zoning Admin	Waverly	yes	14130 Lancashire Rd 427	402-786-2312	clyon@cityofwaverly.com
Dan Henry	City Supervisor	Louisville	Yes	210 Main Louisville 68039	402-505-0709	wateroplant2008@live.com
Ty Andrews	Environ. Svcs M.			1750 S 20th St / Lincoln	402-475-6791	
Gerardo Martinez	Safety & Training	City of Lincoln	Yes	2021 N. 27st Lincoln NE	402 441 7571	gmartinez@lincoln.ne.gov
Greg Maschman	Contractor	Nebr Wesleyan	Yes	5000 St. Paul Ave	402-465-2116	gdm@nebrwesleyan.edu
Terry Kathe	Bldg. Safety ~~City of Lincoln~~	City of Lincoln		555 S. 10th	402-441-6447	tkathe@lincoln.ne.gov
Brian Flesner	Asst. Dir. Facilities	Doane College	yes	1014 Boswell Crete NE	402 499 4802	brian.flesner@doane.edu
Silas Clarke	City Admin	City of Hickman	Yes	115 Locust St PO Box 127 Hickman, NE 68372	402-792-2212	sclarke@hickman-ne.gov

Please Sign In!

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
"Hazard ID Public Meeting"
Lincoln, NE – Thursday, May 16, 2013; 5:30 PM
PLEASE PRINT CLEARLY- THANK YOU!

JEO CONSULTING GROUP INC

NAME	TITLE	JURISDICTION Represented	Official Designated Representative for this Jurisdiction?	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
Jon Meyers	Clerk, Cass Cty, SID #1	Cass County SID #1	Yes		402-290-1999	jmeyers@nebraskawarehouse.com
Brad Niemeyer	Board Member	Hallam	yes		402-239-3169	brad.Niemeyer@yahoo.com
Pam Pickard	Clerk	Panama	yes		402.788.2522	panamaclerk@diodecom.net
[illegible]	Clerk	SID 5	Yes	8400 So 98, 68526	402-483-5901	SID5CHENEY@gmail.com
[illegible]	Facilities Director	Kaplan University		1821 K ST 68508	402-437-2100	ricodnigoe@kaplan.edu
Sheri Henderson	Admin/Clerk	Ceresco	Yes	PO Box 164 Ceresco 68017	402-665-2391	perkyclump@aol.com
[illegible]	V.P. ~~Student~~	SCC - Lincoln	yes	8400 "O" Street	402-437-2554	jvolker@southeast.edu
Brock Thompson	Intern-Planning dpt.	JEO	—	21400 Wavenworth Cir	402-289-4323	bthompson@jeo.com

Please Sign In!

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
"Hazard ID Public Meeting"
Lincoln, NE – Thursday, May 16, 2013, 5:30 PM
PLEASE PRINT CLEARLY- THANK YOU!

JEO CONSULTING GROUP INC

NAME	TITLE	JURISDICTION Represented	Official Designated Representative for this Jurisdiction?	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
Boec				68526		
Jim Boec	Plant Oper	Lancaster	Nebraska Heart Hospital	7440 S 91st Str	402 328 3044	JBoec@Nebraskaheart.com
[illegible]	Planner	JEO	—	650 J st Lincoln NE	402-[illegible]-7885	mrogge@jeo.com
Jordan Gray-Dekraai	Intern - WRED	JEO		650 J st. Lincoln NE	(402) 560-7512	jgray-dekraai@jeo.com

Please Sign In!

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
"Hazard ID Public Meeting"
Weeping Water, NE – Thursday, May 30, 2013; 7:00 PM
PLEASE PRINT CLEARLY- THANK YOU!

JEO CONSULTING GROUP INC

NAME	TITLE	JURISDICTION Represented	Official Designated Representative for this Jurisdiction? (Y/N)	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
Patricia Moreno	Trustee	SID #5	Patricia Moreno	3601 Becker Ct, Plattsmouth	402-296-9231	apmoreno@windstream.net
Kacy Gerdes	City Clerk	City of Weeping Water	Kacy Gerdes	101 W. Eldora PO Box 324 Weeping Water NE 68463	402 267-5152	kg33101@windstream.net
John Dilsaver	Clerk	SID #2	John Dilsaver	PO Box 27049 Omaha NE	402-331-6402	johnd@towno.com
Kermit Kristofersen	Plattsmouth Schools	#1 Plattsmouth	yes	1912 N. Highway 34 Plattsmouth, NE 68048	402-256-3361	kkristofersen@pcsd.org
Lloyd Marcotte	Clerk	Valparaiso	yes	PO Box 147 68065	402-784-2233	villagevalparaiso@yahoo.com
Chuck Paukert	Floodplain mgr.	Village of Cedar Creek	Yes	Box 71, Cedar Creek, NE 68016	402-290-5199-cell	cwpaukert@gmail.com
Kelly Meyer	Chairperson	Manley	Yes	Box 65, Manley, NE 68403	402-234-5232	km622242@windstream.net
Robert C Green	Chairman	Roca	Yes	Box 7 Roca NE 68430	402 423-3304	crosstleman@hotmail.com
Gary Frew	City Council	Weeping Water	Yes	PO Box 453 Weeping Water 68463	402-267-6295	
Travis Moore	Trustee	Eagle	Yes	610 Eagle Drive, Eagle 68347	319-140-1372	travis.moore319@gmail.com
Pat Rule	Clerk	Bennet	Yes	6085 Monroe Str. P.O. Box 255, Bennet 68317	402-782-3000	bennetvlg@diodecom.net
John Buenhaim	Board Chair	Murdock	yes	305 Main	402 867 2036	villageofmurdock@hotmail.com
Eileen Murdoch	Clerk	Murray	Yes	P.O. Box 79, Murray 68409	402-235-2119	Town and Acty@windstream.net
Gary Hellwig	Public Work Dir.	Plattsmouth	yes	136 North 5th St. Plattsmouth 68048	402-296-2176	ghellwig@plattsmouth.org
Troy Calloway	Asst. Manager	Elmwood	yes	108 South 4th St Elmwood NE 68349	402-994-2555	ccrwd@windstream.net
Curtis Wilhelm	Village Trustee	Elmwood	yes	213 West F Street Elmwood NE 68349	402-994-2318	village4elmwood@mgw.com
Beth Johnsen	Superintendent	Murray/Conestoga	yes	104 High Street Murray	402 235 2992	bjohnsen@conestoga.org
Ken Heinz	Superintendent	Weeping Water Schools	yes	224 West O St. WW, NE	402 267-2445	kheinz@weepingwater.k12.ne.us
Rod Trimmer	Village Chairman	Nehawka	Yes	317 Oak St. Nehawka NE	402-297-1957	rod_trimmer@hotmail.com
Pam Zillig	Asst. Mgr	LPSNRD	Yes	-	-	pzillig@lpsnrd.org
Matthew Rogers	Planner	JEO	—	-	-	—
Jordan Grau-Pekvacki	Engineering intern	JEO	—	—	—	—
Parza Shirinova	Planning Intern	JEO	—	—	—	—

Please Sign In!

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
"Hazard ID Public Meeting"
Weeping Water, NE – Thursday, May 30, 2013; 7:00 PM
PLEASE PRINT CLEARLY- THANK YOU!

JEO CONSULTING GROUP INC

NAME	TITLE	JURISDICTION Represented	Official Designated Representative for this Jurisdiction? (Y/N)	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
Janet McCartney	Cass Co. Commissioner	Cass	N	19705 Shoreline Cir. Plattsmouth	402-298-7168	JMMCCART@JAGWireless.NET
Richard Cosgrove	Pres	"				
Deluna Wilg	VP	"	N	9229 Morrow Brady Omaha, Nv	402-254-4568	
Jessica Quady	City Administrator	City of Ashland	Y	2304 Silver Street, Ashland	944-3387	cityadmin@ashland-ne.com
Harold Scott	Superintendent	Parkview Christian School	Yes Y	4400 N. 1st St. Lincoln, Ne 68521	402-474-5820	harold.scott300@gmail.com
Larry Swanson	Board Member	LPS NRD Sub Distr. 3	Lower Platte	616 N. 86th St South NRD Lincoln 68505-3139	402-483-1274	lswanson3@neb.rr.com
Mark Hohensee	MAINTENANCE DIRECTOR	AG. PUBLIC SCHOOL	Y	1225 CLAY ASHLAND, NE 68003	402-953-9830	MARK.HOHENSEE@AGPS.ORG
Glenn VanWesten	Manager	Cass Co RWD #1	Y	P.O. Box 67 Murray Ne.	402-235-3077	?
SANDY WEVERS	CASS CO. E. M	CASS CO	Y	8400 144 WEEPING WATER 68463-0193	402-267-6765	CASSNEEMA@HOTMAIL.COM ccema@cassne.org
Mike Jensen	Cass Co. Zoning	Cass Co.	Y	145 N. 4th Plattsmouth 68048-1961	402-296-9359	Mikej@cassne.org zoning@cassne.org
ED UBBEN	pres. Foundation Atty LPS NRD	LPS NRD	N	3125 PORTIA LINCOLN 68501	402-476-2729	eubben@lpsnrd.org
Melissa Hansen	Village Clerk	Cass	Y	500 Main St Union 68455	402-263-3865	villageofunion@yahoo.com
Marilyn Kirchhoff	Village Clerk	Avoca	Y	PO Box 694, 217 Tofft Avoca	402-275-3757	avocavillage@windstream.net
Kevin Larson	Inspector	Plattsmouth	Y	136 N. 5th St. Plattsmouth 68048	402-296-4168 x 305	klarson@plattsmouth.org
Lou Allgaeyer	Board Member	Elmwood	N	Box 152 68349	402 540 6051	lou.allgaeyer@galaxy.net
Ken Halvorsen	DIST Manager	LANC - other cass / RWD#1	Y	316 Fir St Bennet Ne 68317	402-782-3495	kenh@lrwd1.com
JEFF RAY	DEPT. MANAGER	JEO	N	11717 BURT ST. STE 210	402-779-1070	JRAY@JEO.COM

Please Sign In!

Lower Platte South Natural Resources District

JEO CONSULTING GROUP INC

Lower Platte South NRD Hazard Mitigation Plan Update

Planning Team Meeting

Lincoln, NE – November 19, 2013

PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street Number, Street Name, City, Zip	PHONE	EMAIL
Bill Edwards		Village of Denton.	7100 Lancaster, Denton	402-797-2125.	
Pat Rule	Clerk/Treas	Vlg of Bennet	6085 Monroe St. PO Box 255	402-782-3300	Same
Jessica Quaty	Administrator	City of Ashland	2304 Silver St.	402-944-3387	same
Chad Lyon	Zoning Admin.	City of Waverly	11430 Lancaster St	402-786-2312	clyon@cityofwaverly.com
Jared Nelson	Engineer	City of Lincoln	555 S. 10th St.	402-441-4955,	jlnelson@lincolnne.gov

Lower Platte South Natural Resources District

JEO CONSULTING GROUP INC

Lower Platte South NRD Hazard Mitigation Plan Update
Planning Team Meeting
Lincoln, NE – November 19, 2013
PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street Number, Street Name, City, Zip	PHONE	EMAIL
[illegible]	Treasurer Village Clerk	Hallam	PO Box 81 315 Main St Hallam 68368	402-787-0505	Village of hallam@gmail.com
Leo K Larkin	EM Planner	NEMA	2433 NW 24th St Lnk NE 68524	402 471 7431	leo.larkin@nebraska.gov
Lloyd Moravek	Clerk	Valparaiso	PO Box 147 Valparaiso, NE 68065	402-784-2233	Village of valparaiso@yahoo

Lower Platte South Natural Resources District

JEO CONSULTING GROUP INC

Lower Platte South NRD Hazard Mitigation Plan Update
Planning Team Meeting
Lincoln, NE – November 19, 2013
PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street Number, Street Name, City, Zip	PHONE	EMAIL
Mark Hosking	Deputy EM	Lancaster Co.	233 S. 10th ST Lincoln	402-441-7441	mhosking@lancaster.ne.gov
Jeff Henson	Planner	JEO			
Paul Zillig	Asst Mgr	LPSNRD			
Alessandra Jonker	Planner	JEO		504-941-6618	ajerollemon@jeo.com
John Callen	Engineer	NDNR	301 Centennial Mall S.	(402) 471-3957	john.callen@nebraska.gov
Lalit Jha	Engineer	JEO			
Jeff Ray	Planning	JEO			

Lower Platte South
Natural Resources District

JEO CONSULTING GROUP INC

Lower Platte South NRD Hazard Mitigation Plan Update
Planning Team Meeting
Lincoln, NE – November 19, 2013
PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street Number, Street Name, City, Zip	PHONE	EMAIL
Mark Hosking	Deputy Eng	Lancaster Ent	233 S. 10th Lincoln	441-7441	mosking@lancastrnegov
Paul Zillig	Asst Mgr	LPSNRD		476-2729	
Jeff Henson	Project MNGR	JEO			jhenson@jeo.com

Lower Platte South Natural Resources District

JEO CONSULTING GROUP INC

Lower Platte South NRD Hazard Mitigation Plan Update
Planning Team Meeting
Lincoln, NE – November 19, 2013
PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street Number, Street Name, City, Zip	PHONE	EMAIL
DAVID MOLL	CHAIRMAN	GREENWOOD	GREENWOOD	402-789-2300	DAVIDMOLL1@GMAIL.COM
Pam Pickard	Clerk	Panama	PO Box 117 68419	788.2522	panamaclerk@diodecom.net
John Callen	Engineer	Nebraska DNR	301 Centennial Mall S.	(402) 471-3957	John.callen@nebraska.gov
Elaine Hammer	NRD	LINCOLN	5000 N. 7th	477-0242	[illegible]

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
Mitigation Strategies Meeting
Weeping Water, NE – Thursday, November 21, 2013
PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
Betty Meyer	Chairperson	Village of Manley	PO Box 97	402-234-5232	tm62242@windstream.net
Pam Zimic	Asst Mgr.	LPSNRD		402 476 2729	
Dan Henry	City Manager	Louisville	P.O. Box 320	402-505-0709	waterplant2008@live.com
Ray Frea	City Council	Weeping Water	PO Box 453	402-267-6795	—
Glen Murdoch	Clerk/Treas	Murray	P.O. Box 79	402-235-2119	murrayclerk@windstream.net
Jackie Barnes	Clerk/Treas.	Murdock	P.O. Box 308	402-867-2133	villageofmurdock@hotmail.com
Curtis Wilhelm	Council Member	Elmwood	P.O. Box 215	402-994-2318	stovecreekguy@yahoo.com
Sheri Henderson	Admin/Clerk/Treas.	Ceresco	PO Box 160	402-665-2391	perkyclerk@aol.com
Ken Heinz	Superintendent	Weeping Water	204 West O Weeping Water	402-267-2445	kheinz@weepingwaterne.org
Mitch Paine	Flood Mitigation Planning Coord.	NDNR		402.471.9252	mitch.paine@nebraska.gov
~~Jeff Ray~~	~~Dept Manager~~	~~JBO~~			
Jeff Henson	Project Manage	JBO			

Please Sign In!

Lower Platte South Natural Resources District

Lower Platte South NRD – Hazard Mitigation Plan Update
Mitigation Strategies Meeting
Weeping Water, NE – Thursday, November 21, 2013
PLEASE PRINT CLEARLY- THANK YOU!

NAME	TITLE	JURISDICTION Represented	ADDRESS Street #, Street Name, City, Zip	PHONE	EMAIL
Mike Jensen	Cass County Zoning Administrator	Cass County	145. N. 4th St.	402-296-9359	mikej@cassne.org
Kay Gerdes	City Clerk	City of Weeping Water	101 W Eldora Weeping Water 68463	402 267-5152	Kg33101@windstream.net
Chuck Paukert	Flood Plain administrator	Village of Cedar Creek	Box 71, Cedar Creek, NE 68016	402-290-5199	cwpaukert@gmail.com
DAREN KONDA	SID 1 Cass County Engineer	SID 1, Cass County	10836 Old Mill Road Omaha NE 68164	402-330-8860	dkonda@TD2CO.com
Steve Masters			7836 Sycamore Dr Linda	402-488-1789	stevemasterspe@gmail.com
Gary Hellwig	Public Works Director	City of Plattsmouth	136 N. 5th St. Plattsmouth, NE	402-296-2522	ghellwig@plattsmouth.org
Melissa Hansen	Village Clerk	Village of Union	PO Box 127 Union 68455	402-263-3865	villageofunion@yahoo.com
KEVIN Larson	Inspector	City of Plattsmouth	136 N. 6th ST Plattsmouth 68048	402-296-4168 x305	klarson@plattsmouth.org
Lalit Jha	Engineer	JEO			
BETH JOHNSEN	SUPERINTENDENT	CASS	104 High Murray	235-2992	bjohnsen@conestogaps.org
Jim Noerrlinger	Caretaker Lake Waconda Cass. Co. SID #1	Lake Waconda	2200 east Lake Dr Union NE	402-263-3265	wacondajim@Gmail.com

Please Sign In!

Appendix C – Public Meeting Materials and Worksheets

Contains the following:

1. Example of Hazard Identification Worksheet
2. Example of Risk Assessment Worksheet
3. Example of STAPLEE Worksheet

Hazard Identification Worksheet

ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

LPSNRD – Hazard Mitigation Plan Update

Participant Survey Worksheets

This sheet was completed by: **Date:**_____

Name/Title:_____ **Jurisdiction:**_____

Email/Phone:_____ **Address:**_____

Please use the below definitions when completing the table on the following page:

- Historical Occurrence:
  - Low: no occurrence or a single occurrence in the past 50 years
  - Medium: occurred between one and four times in the past 10 years
  - High: occurred at least once in the past year
- Vulnerability of Population:
  - Low: less than 10% of the population impacted
  - Medium: 10 to 40% of the population impacted
  - High: more than 40% of the population impacted
- Vulnerability of Critical Facilities:
  - Low: less than 10% of critical facilities impacted
  - Medium: 10 to 40% of critical facilities impacted
  - High: more than 40% of critical facilities impacted
- Probability of Occurrence:
  - Low: unlikely to occur at least once in the next fifty years
  - Medium: likely to occur at least once in the next ten years
  - High: likely to occur at least once in the next year
- Typical Warning Time:
  - Less than 24 hours
  - 1 day to 1 week
  - More than 1 week
- Vulnerability of Infrastructure:
  - Low: little to no impact to infrastructure
  - Medium: short term disruption to infrastructure, 1-2 days
  - High: long term disruption or permanent loss of infrastructure
- Potential Impact on Economy:
  - Low: little to no impact on economy
  - Medium: temporary loss of income or jobs
  - High: long term disruption or permanent loss of income and jobs

ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

LPSNRD – Hazard Mitigation Plan Update

Risk Assessment Matrix

Hazard Type	Historical Occurrence (Low, Medium, High)*	Vulnerability of Population (Low, Medium, High)*	Vulnerability of Critical Facilities (Low, Medium, High)*	Probability of Future Occurrence (Low, Medium, High)*	Typical Warning Time (Low, Medium, High)*	Vulnerability of Infrastructure (Low, Medium, High)*	Potential Impact on Economy (Low, Medium, High)*
Flooding							
Levee Failure							
Dam Failure							
Drought							
Extreme Heat							
Grass / Wildfires							
Tornados and High Winds							
Severe Winter Storms							
Severe Thunderstorms							
Chemical Transportation							
Chemical Fixed Facilities							

*See definitions on page one.

ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

LPSNRD – Hazard Mitigation Plan Update

Risk Assessment Matrix

Hazard Type	Historical Occurrence (Low, Medium, High)*	Vulnerability of Population (Low, Medium, High)*	Vulnerability of Critical Facilities (Low, Medium, High)*	Probability of Future Occurrence (Low, Medium, High)*	Typical Warning Time (Low, Medium, High)*	Vulnerability of Infrastructure (Low, Medium, High)*	Potential Impact on Economy (Low, Medium, High)*
Landslides							
Ag Animal Disease							
Ag Plant Disease							
Earthquakes							
Urban Fire							
Transportation							
Terrorism							
Radiological Transportation							
Radiological Fixed Facilities							
Civil Disorder							

*See definitions on page one.

ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

LPSNRD – Hazard Mitigation Plan Update

Current Information Available and Hazard Occurrence Record

Current Information Available

Part of the hazard mitigation planning process involves gathering data and identifying previous sources of information that have been made available. Please identify the studies, reports, memberships, etc. that your jurisdiction has, or is a member of.

Comprehensive Plan	Yes / No	Date Completed: _____
Zoning	Yes / No	Date Completed: _____
Current Membership with NFIP	Yes / No	Date Completed: _____
Drainage Studies or Reports	Yes / No	Date Completed: _____
GIS Data	Yes / No	Date Completed: _____
Other: _____	Yes / No	Date Completed: _____

Public Facilities Valuation

The insured valuation of public facilities is not publicly available. These types of facilities include schools, municipal buildings, and other tax exempt facilities. Please gather and forward that data to the project contact.

Hazard Occurrence Record

Please provide details of past hazard events:

Hazard:	**Date of Occurrence:**
Description of Event (include location, damages, critical facilities, etc.):	
Hazard:	**Date of Occurrence:**
Description of Event (include location, damages, critical facilities, etc.):	

Continued on next page →

ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

LPSNRD – Hazard Mitigation Plan Update

Current Information Available and Hazard Occurrence Record

Hazard:	**Date of Occurrence:**
Description of Event (include location, damages, critical facilities, etc.):	
Hazard:	**Date of Occurrence:**
Description of Event (include location, damages, critical facilities, etc.):	
Hazard:	**Date of Occurrence:**
Description of Event (include location, damages, critical facilities, etc.):	
Hazard:	**Date of Occurrence:**
Description of Event (include location, damages, critical facilities, etc.):	
Hazard:	**Date of Occurrence:**
Description of Event (include location, damages, critical facilities, etc.):	

Capability Assessment Worksheet

Lower Platte South Natural Resrouces District Hazard Mitigation Plan Capability Assessment Survey

Please review the existing plans, strategies, and regulations in your community and answer the questions below. Please provide additional information if any of the plans, strategies, or regulations is identified in your community (e.g., year of adoption, responsible agencies)in the Comment field after the questions.

1. Planning & Regulatory Capability Assessment
Part #1: Existing Plans

	Yes	Under Development	No	Not Sure
Capital Improvement Programs	○	○	○	○
Economic Development Plan	○	○	○	○
Emergency Operations Plan	○	○	○	○
Natural Resources Protection Plan	○	○	○	○
Floodplain Management Plan	○	○	○	○
Storm Water Management Plan	○	○	○	○

Comments

2. Planning & Regulatory Capability Assessment
Part #2: Regulatory Tools

	Yes	In Progress	No	Not Sure
Subdivision Ordinance	○	○	○	○
Floodplain Ordinance	○	○	○	○
Building Codes	○	○	○	○
Well Head Protection Area/District	○	○	○	○

Comments

Next

Lower Platte South Natural Resrouces District Hazard Mitigation Plan Capability Assessment Survey

Please provide information regarding the planning administrative and technical capability of your community. Information shall include, but not limited to, the number of staff and the agency or department name that the staff are working in.

3. Administrative & Technical Capability

	Number of Staff	Staff Tenure	Agency or Department
Planning Commission			
Hazard Mitigation Planning Committee			
Floodplain Administrator			
Emergency Manager			
GIS Coordinator			
Chief Building Official			
Civil Engineer			
Staff who can assess community's vulnerability to hazards			
Grant Manager			
Other			

Department

Prev Next

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Lower Platte South Natural Resrouces District Hazard Mitigation Plan Capability Assessment Survey

Please identify the funding sources in your community. If any of the funding sources are available, have those resources been used or can potentially be used for hazard mitigation actions? Provide the answers to each of the funding sources identified in your community in the Comment field.

4. Fiscal Capability Assessment

	Yes	No	Not Sure
Capital improvement project funding	○	○	○
Community development block grant (CDBG)	○	○	○
Authority to levy taxes for specific purposes	○	○	○
Gas/ electric service fees	○	○	○
Strom water utility fee	○	○	○
Water/sewer service fees	○	○	○
Development impact fees	○	○	○
General obligation revenue or special tax bonds	○	○	○
Other funding	○	○	○

Comments

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Lower Platte South Natural Resrouces District Hazard Mitigation Plan Capability Assessment Survey

Please identify if any of the following projects are or have been established in your community. If yes, provide additional description of how it is related to hazard mitigation and whether it helps implement future mitigation actions in the Comment field.

5. Education & Outreach Capability Assessment

	Yes	No	Not Sure
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	○	○	○
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	○	○	○
Natural Disaster or Safety related school programs	○	○	○
StormReady Certification	○	○	○
Firewise Communities Certification	○	○	○
Tree City USA Program	○	○	○
Public-private partnership initiatives addressing disaster-related issues	○	○	○
Other	○	○	○

Comments

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STAPLEE Worksheet

Lower Platte South NRD Lower Platte South NRD
Multi-Jurisdictional Hazard Mitigation Plan

RANKING OF PROJECTS USING STAPLEE

DATE_____
COMMUNITY: _____
COMPLETED BY: _____

INSTRUCTIONS ON RANKING – On the following page is a list of projects that can be completed in your community to reduce the losses or damages from hazards. This list of projects has been completed based on your input from the last round of meetings, the results of the preliminary risk assessment, and by researching projects that would be beneficial to your community. Listing these projects in the plan does not mean that your community is required to do them, but it does indicate that these projects might be beneficial. These are potential activities your community could do in the future should funds become available. **Please complete the following on the worksheet:**

1) *Add any additional projects that may be beneficial.*
2) *Place a '+', '-'or '0' in each of the columns referring to the STAPLEE criteria. (For example, if a project is 'socially' beneficial to your community then place a '+' under the Social column. If the project would have a negative impact 'politically' then place a '-' under the Political column. If a project will have no discernible impact, use the '0')*
3) *Fill in the blank of who the 'responsible department/agency' would be. If your community were to follow through with implementing this project, what department or agency would be primarily responsible for seeing the project through?*
4) *For the "Project Status" place the following markers as needed: 1 = In Progress, 2 = Complete, 3 = Not Yet Started and 4 = No Longer Relevant*

DEFINITION OF STAPLEE – Mitigation alternatives or actions need to be prioritized based on certain considerations. FEMA recommends using the STAPLEE evaluation, as this process addresses all the major factors when weighing the costs to the benefits of implementing one action over another. Below is an explanation of the STAPLEE criteria taken from FEMA's Multi-Hazard Mitigation Planning Guidance (March 2013):

S – Social: Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the communities social and cultural values.

T – Technical: Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.

A – Administrative: Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.

P – Political: Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support of the action.

L – Legal: It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

E – Economical: Budget constraints can significantly deter the implementation of mitigations actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.

E – Environmental: Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Return To: Paul Zillig, Lower Platte South NRD, pzillig@lpsnrd.org, 402.476.2729, 3125 Portia St., P.O. Box 83581, Lincoln, NE 68501

Lower Platte South NRD Lower Platte South NRD
Multi-Jurisdictional Hazard Mitigation Plan

RANKING OF PROJECTS USING STAPLEE

DATE_____
COMMUNITY: _____
COMPLETED BY: _____

Is the Project Beneficial? ***Place a '+', '-', or '0' in each STAPLEE criteria column.***
Project Status: ***1 = In Progress, 2 = Complete, 3 = Not Yet Started and 4 = No Longer Relevant***

LPS NRD Projects	Social	Technical	Administrative	Political	Legal	Economical	Environmental		Project Status	Responsible Department/Agency
Example: Update Hazard Mitigation Plan	+	+	-	+	+	+	0		1	NRD
1. Continue & Expand Water Conservation Awareness Programs in the NRD, such as pamphlets										
2. Increase public awareness of vulnerability and risk reduction measures through hazard education										
3. Provide backup power systems to provide redundant power supply to critical facilities and key infrastructure										
4. Maintain NRD Master Plan to prioritize all hazard related projects										
5. Maintain NRD Emergency Action Plans to ensure safety of dams in the NRD										
6. Maintain and Update the Integrated Water Management Plan to ensure sufficient water supply for the future										
7. Incorporate known hazards into existing planning mechanisms as appropriate										
8. Develop continuity plans for critical community services										
9. Educate local businesses on the value of continuity planning										
10. Preserve natural and beneficial functions of floodplain land through measures such as: retaining natural vegetation, restoring streambeds; and preserving open space in the floodplain.										
11. Adopt a No Adverse Impact approach to floodplain management										
12. Utilize Low Impact Development practices and Green Infrastructure to reduce flood risk										

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Lower Platte South NRD Lower Platte South NRD
Multi-Jurisdictional Hazard Mitigation Plan

LPS NRD Projects	Social	Technical	Administrative	Political	Legal	Economical	Environmental		Project Status	Responsible Department/Agency
13. Educate the public and business owners regarding rain gardens, green roofs, and other minor mitigation measures										
14. Install vehicular barriers to protect critical facilities and key infrastructure where possible.										
15. Continue to work with state agencies such as NDNR to reduce hazard risk										
16. Assist jurisdictions with plan maintenance										

* Projects listed in RED were identified by the project team that could be beneficial to your community.

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Appendix D – Worksheets to Assist Community in Review and Updates

Worksheet # 1: Progress Report

Progress Report Period:_____ to _____
(Date) (Date)

Project Title: _____ Project ID#: _____

Responsible Agency: _____

Address: _____

City/County: _____

Contact Person: _____ Title: _____

Phone #(s): _____ e-mail address: _____

List Supporting Agencies and Contacts: _____

_____

Total Project Cost: $_____ Anticipated Cost Overrun/Under run: _____

Date of Project Approval: _____ Start date of the project: _____

Anticipated completion date: _____

Description of the Project (include a description of each phase, if applicable, and the time frame for completing each phase).

_____
_____
_____
_____
_____

Milestones	Complete	Projected Date of Completion

_____

_____

Plan Goal(s)/Objective(s) Addressed:

Goal: _____

Objective: _____

Indicator of Success (e.g., losses avoided as a result of the acquisition program):
In most cases, you will list losses avoided as the indicator. In cases where it is difficult to quantify the benefits in dollar amounts, you will use other indicators, such as the number of people who now know about mitigation or who are taking mitigation actions to reduce their vulnerability to hazards.

_____
_____
_____

Status *(Please checks pertinent information and provide explanations for items with an asterisk. For completed or canceled projects, see Worksheet #2 — to complete a project evaluation):*

Project Status	Project Cost Status
(1) ☐ Project on schedule	(1) ☐ Cost unchanged
(2) ☐ Project completed	(2) ☐ Cost overrun* *explain: _____
(3) ☐ Project delayed* *explain: _____	(3) ☐ Cost under run* *explain: _____
(4) ☐ Project canceled	

Summary of progress on project for this report:

A. What was accomplished during this reporting period?

B. What obstacles, problems, or delays did you encounter, if any?

C. How was each problem resolved?

Next Steps: What is/are the next step(s) to be accomplished over the next reporting period?

Other comments:

Worksheet #2: Evaluating Your Planning Team

When gearing up for the plan evaluation, the planning team should reassess its composition and ask the following questions:

	YES	NO
Have there been local staffing changes that would warrant inviting different members to the planning team? Comments/Proposed Action:		
Are there organizations that have been invaluable to the planning process or to project implementation that should be represented on the planning team? Comments/Proposed Action:		
Are there any representatives of essential organizations who have not fully participated in the planning and implementation of actions? If so, can someone else from this organization commit to the planning team? Comments/Proposed Action:		
Are there procedures (e.g., signing of MOAs, commenting on submitted progress reports, distributing meeting minutes, etc.) that can be done more efficiently? Comments/Proposed Action:		
Are there ways to gain more diverse and widespread cooperation? Comments/Proposed Action:		
Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning? Comments/Proposed Action:		

If the planning team determines the answer to any of these questions is "yes," some changes may be necessary.

Worksheet #3: Evaluate Your Project Results

Project Name and Number: Project Budget: Project Description: Associated Goal and Objective (s): Indicator of Success (e.g., losses avoided):	*Insert location map* *include before and after photos if appropriate*

Was the action implemented?

IF YES ↓

What were the results of the implemented action?

IF NO ↓

Why not?

Was there political support for the action?	YES	NO
Were enough funds available?	YES	NO
Were workloads equitably or realistically distributed?	YES	NO
Was new information discovered about the risks or community that made implementation difficult or no longer sensible?	YES	NO
Was the estimated time of implementation reasonable?	YES	NO
Were sufficient resources (for example staff and technical assistance) available?	YES	NO

Were the outcomes as expected? **YES** **NO** Additional comments or other outcomes:
If No, please explain:

Did the results achieve the goal and objective (s)? **YES** **NO**
Explain how:

↓

Was the action cost-effective? **YES** **NO**
Explain how or how not:

What were the losses avoided after having completed the project?

If it was a structural project, how did it change the hazard profile?

Date _____

Prepared by: _____

Worksheet #4: Revisit Your Risk Assessment

Risk Assessment Steps	Questions	YES	NO	COMMENTS
Identify hazards	Are there new hazards that can affect your community?			
Profile hazard events	Are new historical records available?			
	Are additional maps or new hazard studies available?			
	Have chances of future events (along with their magnitude, extent, etc.) changed?			
	Have recent and future development in the community been checked for their effect on hazard areas?			
Inventory assets	Have inventories of existing structures in hazard areas been updated?			
	Are future developments foreseen and accounted for in the inventories?			
	Are there any new special high-risk populations?			
Estimate losses	Have loss estimates been updated to account for recent changes?			

If you answered "Yes" to any of the above questions, review your data and update your risk assessment information accordingly

Worksheet #5: Revise the Plan

Prepare to update the plan.

When preparing to update the plan: **Check the box when addressed ✓**

1. Gather information, including project evaluation worksheets, progress reports, studies, related plans, etc. ☐
Comments:

2. Reconvene the planning team, making changes to the team composition as necessary (see results from *Worksheet #2*). ☐
Comments:

Consider the results of the evaluation and new strategies for the future.

When examining the community consider: **Check the box when addressed ✓**

1. The results of the planning and outreach efforts. ☐
Comments:

2. The results of the mitigation efforts. ☐
Comments:

3. Shifts in development trends. ☐
Comments:

4. Areas affected by recent disasters. ☐
Comments:

5. The recent magnitude, location, and type of the most recent hazard or disaster. ☐
Comments:

6. New studies or technologies. ☐
Comments:

7. Changes in local, state, or federal laws, policies, plans, priorities, or funding. ☐
Comments:

8. Changes in the socioeconomic fabric of the community. ☐

Comments:

9. Other changing conditions. ☐

Comments:

Incorporate your findings into the plan.

When examining the plan: **Check the box when addressed ✓**

1. Revisit the risk assessment. ☐

Comments:

2. Update your goals and strategies. ☐

Comments:

3. Recalculate benefit-cost analyses of projects to prioritize action items. ☐

Comments:

Use the following criteria to evaluate the plan:

Criteria	YES	NO	Solution
Are the goals still applicable?			
Have any changes in the state or community made the goals obsolete or irrelevant?			
Do existing actions need to be reprioritized for implementation?			
Do the plan's priorities correspond with state priorities?			
Can actions be implemented with available resources?			

Comments:

Appendix E – Stakeholder Groups

Stakeholder Group	Contact	Title	Participated in the Plan
Ashland Care Center	Benjamin Eddy	Administrator	
Ashland Chamber of Commerce	Chamber of Commerce		
Bryan LGH Medical Center	John Woodrich	Administrator	
Cass County Farm Bureau	Rob Robertson	Chief Administrator/Secretary-Treasurer	
Cass County Economic Development Council	John Yochum	Executive Director	
Eastmont Towers	Beth Nelsen	Administrator	
Farm service Agency, Lancaster County	Greg Chewakin	County Executive Director	
Gateway Senior Living	Amy Fish	Administrator	
Golden Living Center	Joseph Shafer	Administrator	
Holmes Lake Manor	Vicky Jones-Goc	Administrator	
Homestead Nursing & Rehabilitation Center	Matt Romshek	Executive Director	
Kiwanis - Division 21	Sue Alby	Trustee	
Kiwanis - Division 22	Gary Herr	Trustee	
Lancaster County Farm Bureau	Steve Nelson	President	
Lancaster Manor	Shari Little	Administrator	
Lincoln Chamber of Commerce	Wendy Birdsall	President	
Lincoln Mayor's Roundtable (Neighborhood Assoc's)	Jon Carlson	Aide to Mayor Beutler	
Louisville Care Center	Kari Wockenfuss	Administrator	
Madonna Rehabilitation Hospital	Marsha Lommel	Administrator	
Milder Manor	Larry Van Hunnik/ Ty Andrews	Administrator/ Environmental Services	Yes
Nebraska Heart Hospital	Jim Bouc	Plant Operations	Yes
Plattsmouth Chamber of Commerce	Max Kathol	Executive Director	
Rotary Club #14	Mike Wortman	President	
Saint Elizabeth Regional Medical Center	Kim Moore	Administrator	
Southlake Village Rehabilitation & Care Center	Aimee Middleton	Administrator	
St. Jane de Chantal Long Term Care/Madonna Rehab Center	Paul Nathenson	Administrator	
Tabitha Nursing Home	Anne Ferguson	Administrator	
The Ambassador	Mark Hoyle	Administrator	
The Nebraska Masonic Home	Mary Vrbka	Administrator	
Waverly Area Chamber of Commerce	Alexandrea Hill		
Waverly Care Center	David Bergmann	Administrator	
Lincoln Airport Authority	John Wood	Executive Director	
Bennet Rural Fire Dept	David May	Chief	

Firth Rural Fire Dist	Charles Krogman	Chief	
Hallam Vol Fire & Rescue	Duane Aksamit	Chief	
Hickman Rural Fire & Rescue	Stan Draper	Chief	
Lincoln Fire & Rescue	John Huff	Chief	
Malcolm Fire And Rescue	Dale Heidtbrink	Chief	
Raymond Vol Fire & Rescue 1	Les Hornung	Chief	
Southeast Rural Fire Dist	Steve Phillips	Chief	
Southwest Rural Fire Dept	Philip Nalley	Chief	
Waverly Fire & Rescue	Mike Binder	Chief	
Alvo Vol Fire Dept	Richard Koutecky	Chief	
Avoca Rural Fire Dist 5	Martin Brammier	Chief	
Cedar Creek Vol Fire Dept	Rick Hightree	Chief	
Eagle Fire & Rescue	Rick Weyers Jr	Chief	
Elmwood Vol Fire Dept	Dan Spaulding	Chief	
Greenwood Vol Fire & Rescue	Mark Sobota	Chief	
Louisville Vol Fire & Rescue	Jason Mcclun	Chief	
Manley Fire Dept	James Woolhiser	Chief	
Murdock Vol Fire Dept	Alan Brockhoff	Chief	
Murray Fire & Rescue	Jim Daly	Chief	
Nehawka Rural Fire Dept	Christopher Huckleberry	Chief	
Plattsmouth Vol Fire Dept	William Dudek	Chief	
Union Vol Fire Dept	William Bescheinen	Chief	
Weeping Water Vol Fire Dept	Earnest West	Chief	
Ashland Fire Dept	Brian Whitehead	Chief	
Valparaiso Fire & Rescue	Dallas Fletcher	Chief	
Brainard Vol Fire Dept	John Bongers	Chief	

Hazard Mitigation Project Funding Guidebook
Contents

Section One: **Overview**

Section Two: **Hazard Mitigation Project Funding Opportunities**

3.1 General
3.2 Federal Resources
3.3 State of Nebraska Resources and Priorities
3.4 Alternative Funding Sources

Section Three: **References**

4.2 Hazard Mitigation Project Funding Opportunities

SECTION ONE: OVERVIEW

This *Hazard Mitigation Project Funding Guidebook* is provided by JEO Consulting Group, Inc.

The intent of the Guidebook is to provide initial guidance on:

- Hazard mitigation project funding opportunities
- Where to find more information

The information in this Guidebook is consistent with established processes for hazard mitigation planning. However, it is important to note the following in terms of the context for this Guidebook relative to the overall planning process:

- Project identification includes identifying all possible options (or alternatives) to address planning objectives; i.e., at this stage, there are no "bad" options. At times, the best option may be to work with other actors in the community to design solutions that are responsive to community values while reducing risk (i.e. a bike path or ball field that can double as a retention area, or the preservation of an animal habitat that also serves as a natural buffer). These types of solutions can often be funded in very innovative ways, including solutions which increase local industry and revenue (i.e. tapping into the entrepreneurial community).
- Project identification is followed by a comprehensive evaluation of possible project options to identify viable, preferred option(s) for development of specific implementation strategies. Preferred options may change as different stakeholders come to the table and additional ideas are proposed or funding sources identified. Incremental mitigation projects, in which risk is slowly bought down through a comprehensive range of actions, can be a much more realistic strategy than identifying the one best (and often costliest) solution.
- Project evaluation criteria include the need for and the availability of funding for specific project options along with technical feasibility, environmental consequences, cost effectiveness, etc.

Even though funding availability is "technically" part of project evaluation, this Guidebook offers information regarding availability of funding in addition to information about identifying projects. The purpose is to reflect the importance of linking project options with potential funding and implementation mechanisms as early as possible to eliminate options with little or no prospects for funding but more importantly, to recognize that successful implementation of the resulting hazard mitigation plan (HMP) will require creative approaches to project funding and the documentation of successful projects. Knowledge of a broader range of funding opportunities and mechanisms beyond federal hazard mitigation grant programs will enable the planning team to keep as many implementation options open as possible, as well as to ensure that some minimal projects can be completed in between plan updates.

SECTION TWO: HAZARD MITIGATION PROJECT FUNDING OPPORTUNITIES

3.1 GENERAL

When the current FEMA hazard mitigation planning program was formulated in the late 1990s as part of the Disaster Mitigation Act of 2000 (DMA 2000), there was an assumption that federal funding would be provided on an substantial, on-going basis for implementing hazard mitigation projects. While hundreds of millions of dollars have been provided by the federal government over the last decade, primarily through FEMA hazard mitigation grant programs, the level of funding has varied from year to year and future prospects are unclear. Additionally, some communities have not been successful in their pursuit of these grants and have not seen the value of their investment in mitigation planning. As a result, while it is still important to have a grasp of how these legacy federal programs can be used to fund hazard mitigation projects, it is increasingly important to look for other opportunities.

Opportunities for funding and technical assistance exist in other federal agencies or possibly state or local agencies. In addition, alternative funding opportunities can be developed at the regional or local level with private sector businesses, private foundations, and other non-governmental organizations (NGOs). In order to fully map out the range of local and state options it is necessary to undertake a detailed stakeholder analysis – something which has not been done at this time. The following contains a brief overview of federal, state, and local government programs that may include opportunities for hazard mitigation project funding as well as alternatives within the private sector and NGOs.

3.2 FEDERAL RESOURCES

Information about federal hazard mitigation project funding opportunities is organized per the following categories:

- FEMA Unified Hazard Mitigation Assistance Grant Programs
- Other FEMA Hazard Mitigation Programs
- Other Federal Agency Programs

3.2.1 FEMA UNIFIED HAZARD MITIGATION ASSISTANCE GRANT PROGRAMS

There are three (3) grant programs administered at the federal level by FEMA that are grouped under the umbrella heading of the "Unified Hazard Mitigation Assistance Grant Programs" (HMA) including:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

These programs also have a counterpart agency at the State level. For Nebraska, HMGP and PDM are administered at the state level by the Nebraska Emergency Management Agency (NEMA). The FMA program is managed by the Nebraska Department of Natural Resources (NDNR). Periodically, FEMA issues guidance covering the administrative elements for all three (3) programs, titled the *Hazard Mitigation Assistance Unified Guidance*. The most recent guidance was released in 2013.

There are a number of similarities and differences between these programs but it is important to note three distinctions between HMGP and the other four HMA programs:

- HMGP is only available when authorized under a Presidential major disaster declaration, i.e., post-disaster. The other four HMA programs, when funding is appropriated by Congress, are available pre-disaster.
- Project eligibility under HMGP can be limited by the State as part of the HMGP Administrative Plan developed post-disaster. For example, funding may only be made available for projects that are related to the type of disaster; i.e., HMGP related to a significant flood disaster declaration may only be designated for flood mitigation projects like acquisitions of repetitively flooded properties.
- Eligible projects can include project types that are not typically funded by FEMA hazard mitigation programs if FEMA authorizes what is referred to as the "5% initiative". Generally reserved for very large disasters, authorizing the 5% initiative can make funding available for new, unproven mitigation techniques and technologies where benefits are not proven or not clearly measurable such as back-up generators, disaster warning equipment and systems, hazard identification or mapping efforts, and studies or plans to reduce disaster losses. The current State of Nebraska Administrative Plan for HMGP associated with FEMA 4014-DR-NE identifies the potential use of the 5% initiative for that particular disaster event.

Note: Section Three includes individual website URLs for more detailed information on these three HMA programs and the Hazard Mitigation Assistance Unified Guidance.

3.2.2 OTHER FEMA HAZARD MITIGATION PROGRAMS

Two (2) other FEMA programs include the potential for funding hazard mitigation projects that may be identified:

- Fire Management Assistance Grant Program (FMAGP) - FMAGP may be applicable to some areas of Nebraska; the NESHMP identifies Wildfires as the third highest ranked hazard on a state-wide basis. FEMA provides the following overview of the FMAGP program:

  [FMAGP] is available to States, local and tribal governments, for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster.

- Public Assistance (PA) Section 406 Hazard Mitigation Funding – Generally, PA funds are provided post-disaster for the restoration of public infrastructure that has sustained damaged due to a presidentially-declared disaster. The legislation authorizing PA also includes a "*provision for the consideration of funding additional measures that will enhance a facility's ability to resist similar damage in future events*." It is important to note that Section 406 funding can only be used on parts of a facility that were actually damaged by the disaster; although in some cases the damages are sufficient that the entire facility must be replaced.

  Therefore, it is often difficult to include the type of specific predictions in a HMP that would lead to identifying Section 406 as a prime option for funding but it should be noted in the HMP and referenced wherever it is potentially applicable. Areas of vulnerability for particular buildings, or building types, identified through the HMP can be a resource for the identification of PA mitigation projects. Additionally, local and state staff should receive training in the successful use of PA.

Additional FEMA programs include: Community Assistance Program which assists states with the NFIP; various post-disaster funds and programs; and Assistance to Firefigher Grants which can assist with the enhancement of response capabilities.

Note: Section Three includes individual website URLs for more detailed information on these two FEMA programs that are also the sources of the quoted passages.

3.2.3 OTHER FEDERAL AGENCY PROGRAMS

Although FEMA programs are typically thought of as the primary sources of federal agency hazard mitigation project funding, there are a significant number of agencies with programs relevant to local HMPs and hazard mitigation project implementation. The following indicates some of the federal programs which may be of assistance in funding certain types of hazard mitigation projects – or portions of those projects.

Table 1: Federal Programs

Source	Description	Additional Notes	Website
Advisory Council on Historic Preservation	The Preserve America matching-grant program provides planning funding to designated Preserve America Communities to support preservation efforts through heritage tourism, education, and historic preservation planning.	This funding source may be considered as part of efforts to ensure that historic structures are protected from natural hazards. The City of Lincoln is a Preserve America Community.	http://www.preserveamerica.gov/
National Endowment for the Humanities	The National Endowment for the Humanities manages multiple grant programs which may be relevant.	Programs support educational initiatives and cultural institutions.	http://www.neh.gov/grants
U.S. Department of Agriculture (USDA)	USDA administers several programs that are potentially relevant including the National Institute of Food and Agriculture (NIFA), Natural Resource Conservation Service (NRCS), Rural Development, and the Farm Service Agency (FSA).	There are many different NRCS programs which can provide technical assistance and construction of improvements to relieve imminent hazards to life and property from floods and erosion. There are also various rural development programs which can support essential services such as sewer services and assist with fire and police stations. USDA programs also support renewable energy efforts. However, other USDA programs should be examined relative to identified projects to find potential matches with funding and assistance provisions.	http://www.usda.gov/wps/portal/usda/usdahome?navid=GRANTS_LOANS

U.S. Department of Commerce	Economic Development Administration (EDA) – EDA primarily provides a variety of grants, loans, and technical assistance to support long-term economic recovery but also has supported grants for upgrades to critical public infrastructure and essential facilities.	There are various programs and resources available through EDA. The National Weather Service and National Oceanic and Atmospheric Administration have also had programs in the past, but are restricted by funding at the moment.	http://www.eda.gov/ffo.htm
U.S. Army Corps of Engineers (USACE)	USACE can provide a broad range of assistance under legislative authority related to flood control for floodplain management planning, stream bank and shoreline protection, and aquatic ecosystem restoration.	USACE projects generally involve watershed level activities and long project development and implementation timelines but may be applicable to regional considerations.	http://www.nwo.usace.army.mil/
U.S. Dept of Education	Grants support LEAs in the development of communitywide approaches to creating safe and drug-free schools and promoting healthy childhood development. Programs are intended to prevent violence and the illegal use of drugs and to promote safety and discipline. Coordination with other community-based organizations (CBOs) is required. This program is jointly funded and administered by the departments of Education, Justice, and Health and Human Services. The appropriation amounts listed above do not include funds appropriated for the departments of Justice and Health and Human Services.	This program can be used to work towards safer schools, taking various potential risks into account.	http://www2.ed.gov/programs/dvpsafeschools/index.html
U.S Department of Energy (DOE)	DOE undertakes a range of missions related to electricity and energy including improving "*the ability of energy sector stakeholders to prevent, prepare for, and respond to threats, hazards, natural disasters, and other supply disruptions*". DOE works closely with State and local governments on energy assurance issues and develops products and tools to inform and educate State and local officials to support their energy emergency response activities. DOE also partners	DOE programs fund weatherization efforts, support renewable energy efforts which can be a portion of an energy assurance effort, and can provide technical assistance through the Nuclear Safety and Environment Program.	http://energy.gov/public-services/funding-opportunities

	with State and local organizations to further assist in these efforts including the National Association of State Energy Officials, National Association of Regulatory Utility Commissioners, National Governors Association, National Conference of State Legislatures, and at the local level, Public Technology Institute. Recently, DOE created the Local Energy Assurance Program (LEAP) which included more than $8 million in LEAP grants to 43 cities and towns across the country to develop or expand local energy assurance plans to improve electricity reliability and energy security in these communities		
US Dept of Health & Human Services	The US Dept of Health & Human Services and its various agencies provide a wide range of grants and technical assistance programs.	Grant programs include technical: assistance and training related to ensuring safe water and wastewater treatment for rural areas; program to provide AEDs; and programs to ensure that rural areas have access to health services.	http://www.hhs.gov/grants/index.html
U.S. Department of Housing and Urban Development (HUD)	HUD administers the Community Development Block Grants (CDBG). CDBG funds have been used in conjunction with other hazard mitigation funding sources, e.g., HMGP, to implement projects including acquisitions and elevation of flood prone properties. However, HUD funding for hazard mitigation projects usually comes via special Congressional appropriations related to specific disaster events.	CDBG funds can play a key role in hazard mitigation.	http://portal.hud.gov/hudportal/HUD?src=/topics/grants
US Dept of Justice	The Office of Community Oriented Policing services offers funding to assist with community policing capacity.	This program may be relevant to communities which identify crime, acts of violence and/or terrorism as a hazard.	http://www.justice.gov/business/
US Dept of Labor	National Emergency Grants (NEGs) temporarily expand the service capacity of Workforce Investment Act Dislocated Worker training and	Training and temporary jobs can focus on weatherization or possibly mitigation related activities.	http://www.doleta.gov/neg/

	employment programs at the state and local levels by providing funding assistance in response to large, unexpected economic events which cause significant job losses. NEGs generally provide resources to states and local workforce investment boards to quickly reemploy laid-off workers by offering training to increase occupational skills.		
US Dept of the Interior	The National Parks Service has multiple grants allowing for the purchase of land for recreational facilities, the rehabilitation of recreation facilities, and protecting cultural treasures.	These programs could assist with the securing of land which can serve a dual purpose of mitigation and recreation, as well as for protecting some historic sites.	www.nps.gov
US Dept of Transportation	Funds support recreational trails, bridge replacement, safe routes to schools, road projects in rural areas, and other programs.	These funds can be incorporated into multi-objective projects aimed at hazard mitigation.	http://www.dot.gov/grants
U.S. Environmental Protection Agency (EPA	In May, 2010, EPA signed a memorandum of agreement with FEMA to "*formalize efforts to explore opportunities to incorporate sustainability and smart growth practices into communities' hazard mitigation planning and long term disaster recovery efforts, and to incorporate hazard resilience into smart growth assistance for communities.*" The intent is to coordinate parallel activities within these agencies for an array of policy initiatives that include climate change considerations. For projects that are intended to improve land use planning practices, this joint effort could provide valuable technical assistance.	EPA programs support efforts to clean up brownfields, support water quality, provide safe drinking water, promote green communities, and watershed protection.	http://www2.epa.gov/home/grants-and-other-funding-opportunities
Small Business Administratio n (SBA)	SBA Disaster Loan Program (DLP) is a significant source of assistance for homeowners, renters, businesses, and nonprofit organizations in the aftermath of disasters. Although this is a post-disaster funding mechanism, it is important to note that loans can be increased up to 20% for mitigation	Small businesses can use SBA loans for many purposes, before and after a disaster.	

	to protect property from future disasters of the same kind that caused the current damage.		

These are by no means the only non-FEMA, federal agency programs that could have the potential to support hazard mitigation project implementation. Additionally many of these programs are dependent on yearly funding allocations. However, at this point, it is more important to be aware of the potential for other federal agencies to support a broad array of project types. As needs and potential hazard mitigation project options are identified, more information can begin to be gathered on the range of programs which might be utilized. It will be more efficient to start with project options and then follow-up with the identification of potential matches, working with the full range of available programs and agencies as part of a comprehensive project evaluation process.

3.3 STATE OF NEBRASKA RESOURCES AND PRIORITIES

The 2011 NESHMP identifies a number of agencies and programs with potential applicability to supporting funding and implementation of mitigation projects in addition to the federal hazard mitigation grant programs administered at the state level by NEMA and NDNR already mentioned above. These agencies will also likely be important in earlier stages of the hazard mitigation planning process by providing current hazard and risk assessment data, including:

- NDNR – Public outreach and education programs should be incorporated and cross-referenced as part of any corresponding programs recommended as part of HMPs

- Climate Assessment and Response Committee (CARC) – CARC is a committee comprised of other state agencies and other stakeholders including the University of Nebraska and private livestock and crop producers. A primary concern of the CARC appears to be drought mitigation and at a minimum, the CARC should be a good source of technical support for related mitigation actions at the region or local levels.

- Nebraska Forest Service (NFS) – Per the NESHMP, the NFS "administers state and federal grant monies for fuel treatment on private property…for thinning forested tracts and for applying firewise principles to properties."

One existing mechanism for agency collaboration, particularly in the area of flooding, is the Nebraska Silver Jackets Program (http://silverjackets.dnr.ne.gov/). Silver Jackets teams are active in many states and consist of various state and federal agencies working together in support of flood risk reduction.

Some state agencies which provide technical assistance and other resources include:

- Nebraska Department of Environmental Quality
- Nebraska Department of Economic Development
- Nebraska Department of Roads
- Nebraska Game and Parks Commission
- Nebraska State Historic Preservation Office

In addition to these programs, it is important to always have a sense of the priorities that are identified by other agencies in influential positions regarding future grant funding. For example, the 2012 State of Nebraska Administrative Plan for HMGP, consistent in many ways with aspects of the NESHMP, identifies eligible project types such as:

- Structural hazard control or protection projects
- Retrofitting of facilities
- Property acquisition or relocation
- Development or improvement of warning systems
- Dead-end storm structures
- Replacement of conductors to T-2 Conductors, e.g., for increased wind resistance for electrical transmission lines

3.4 ALTERNATIVE FUNDING SOURCES

In recent years, states and communities across the country have sought and developed innovative funding sources as alternatives to traditional government grant programs. This will be important for current and future hazard mitigation planning efforts for several reasons including:

- Decreases in funding for pre-disaster mitigation grant and assistance programs at the federal level and for state agencies - While technical assistance and other related support functions are still actively supported across federal and state agencies, and in some cases are increasing, allocations for "bricks and mortar" pre-disaster hazard mitigation projects will be competing with a broad range of government funding needs. These funds may not completely disappear but the need will continue to outstrip the supply for the foreseeable future.

- Opportunities to fund projects that might not qualify or align with traditional grant and assistance programs. Funding programs seek solutions that reduce risk for a particular threshold (i.e. 1% flood) and meet absolute cost-benefit criteria that the agencies themselves must adhere to. Therefore, these programs, by their basic nature, are not able to support efforts that may help most of the time but don't meet these thresholds, e.g., a homeowner installed flood wall in a repetitive loss area that prevents annual floods, but not larger magnitude events that come along every few years. There is a related concept that can be referred to as "cumulative risk reduction". For example, a homeowner with limited resources (and no real access to grant funds) might be willing to spend a little time and money each year getting just a little bit safer.

The following identifies general kinds of alternative funding sources and techniques that have been employed in other communities:

- Local Funding Options
- Public-Private Partnerships
- Private Foundations

3.4.1 LOCAL FUNDING OPTIONS

Local funding options are just what they sounds like, using local funds for local mitigation projects. Local funds are also needed as the non-federal share or "matching funds" for federal grant programs but can also be used independently to fund a range of project types. Local funding options include the following:

- Capital Improvement Programs – On-going civic improvements can include prioritized hazard mitigation projects or mitigation can be included as one aspect of a larger project. For example, improving the hydraulic capacity of a culvert or bridge to prevent upstream flooding while undertaking periodic replacements for end of service considerations is one example. Replacing windows in a school with shatter resistant glass as part of a overall renovation is another example. Capital improvement programs are generally funded with local tax revenues and municipal bonds.

- Permits, Fees, and Developer Contributions- Communities can establish fees, earmark a portion of existing permit and fee structures, and/or establish requirements for developer contributions for new developments in hazard prone areas that can then be used to fund local mitigation projects. The proceeds can be accumulated in what is often referred to as a "Mitigation Trust Fund" and the uses are typically tied to specific project types and/or relationships with projects already identified in specific plans or documents such as an HMP. These types of funds can also be used to create vouchers or other incentives to individual action.

- Force Account / In-Kind Services – Although there is a "cost" associated with activities of of public employees, there are a wide range of activities that can be undertaken by local government staff and officials as well as interested parties on their behalf that would yield significant benefits. Some of the obvious examples are public outreach and education for individual property owners, business and institutions to reduce their risk through correspondingly inexpensive or essentially activities. This would include tapping into available educations resources[2], promoting individual action, etc.

- Property Owners – For a project that directly benefits one or more specific properties, the property owner can be asked to contribute. Through the HIRA process, property owners can become better aware of their risks and options. Owners that recognize they have a real flood problem may be willing to pay a portion of the cost. In recent years, property owners have voluntarily agreed to pay the non-federal share (up to 25% of the total project cost) for FEMA HMA grants in some states. In some cases, the owners have paid even higher percentages of the cost. In addition, after a flood, owners may have cash from insurance claims or disaster assistance that they will be using to repair their homes and properties. By including the right floodproofing and mitigation project components into the repairs, the resilience of the property to future flooding may be improved.

  Having property owners contribute to the project can help stretch available local funds and also gives the property owner an enhanced stake in the outcome of the project and incentive to make sure the property is properly maintained.

- Individual Participation – Although mitigation is ultimately intended to benefit individuals, HMPs often neglect to integrate participation of potential beneficiaries into the process. The participation by individuals, including small business owners, is important for making sure the resulting HMP reflects community needs and priorities but it also allows for the planning team to identify measures and options that individuals can take to reduce their own risk at a cost they can afford.

3.4.2 PUBLIC-PRIVATE PARTNERSHIPS

Developing a "public-private partnership" is a phrase used frequently in a wide range of government programs and for good reason, especially in the content of hazard mitigation. Similar to the point made in the preceding subsection regarding individual participation, participation of private sector organizations in solving their own hazard risk situations can be a low-cost and effective method. The phrase also encompasses finding opportunities for public and private sector partners to share costs equitably for larger projects that require substantial funds to implement. Private sector businesses and organizations have their own cost-benefit calculations to perform but joint efforts may make the balance sheets work for both sides.

3.4.3 PRIVATE FOUNDATIONS

Cultivating relationships with local, regional, or even national foundations with interests or missions consistent with hazard mitigation, community sustainability, climate change adaptation, and other related topics can yield successful results in terms of funding and other means of support.

There are many local foundations around the State of Nebraska, many of which fund programs that can be utilized for components of hazard mitigation projects. Many of these foundations only support non-profit organizations, so the applicability of these funds to projects depends upon the partners involved.

This approach is not as easy to develop as simply listing grants and funding mechanisms as it involves engaging a broad spectrum of stakeholders and employing combinations of funding sources in solving what are increasingly sticky issues related to funding for any public endeavor. However, as noted throughout this guidebook, the reality is that significant federal or state grant allocations for pre-disaster mitigation efforts

[2] Several states and agencies have created resources for homeowners, some of which could be readily adapted for use in Nebraska.

are not apparent on the immediate horizon and communities will need to be creative, cooperative and proactive to realize risk reduction on a meaningful level.

SECTION FOUR: REFERENCES

4.1 HAZARD MITIGATION PROJECT FUNDING

The following includes current websites with more detailed information about several of the programs and documents mentioned in this Guidebook.

- *Hazard Mitigation Assistance Unified Guidance*. The current version of this guidance document was developed in 2013 and can be found at: http://www.fema.gov/library/viewRecord.do?id=3649.

In addition, the individual grant programs each have specific websites per the following:

- Hazard Mitigation Grant Program (HMGP)
  http://www.fema.gov/hazard-mitigation-grant-program

- Pre-Disaster Mitigation (PDM)
  http://www.fema.gov/pre-disaster-mitigation-grant-program

- Flood Mitigation Assistance (FMA)
  http://www.fema.gov/flood-mitigation-assistance-program

- Fire Management Assistance Grant Program (FMAGP) -
  http://www.fema.gov/fire-management-assistance-grant-program

- Public Assistance (PA) Section 406 Hazard Mitigation Funding
  http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0

Note: These websites and reference materials are as current as possible. However, one important aspect of grant programs that is not just applicable to hazard mitigation or to government agencies, is that the status, priorities, and administration of funding sources and programs is dynamic, i.e., subject to frequent changes in direction and emphasis. Therefore, it is useful to be familiar with the current information but it is equally, if not more important, to engage candidate federal and state agencies in a dialog as soon as possible. The intent is to determine the most current information about grant project status and priorities for inclusion in the evaluation of hazard mitigation projects and the development of implementation strategies.

On a related note, it is also recommended to include specific reference in plan maintenance procedures to the monitoring and updating of information regarding grant programs and the agencies or foundations that administer these grants.

There are also a number of documents that include a broad range of project types and how these have been implemented in communities across the country including:

Mitigation Best Practices Portfolio
http://www.fema.gov/mitigation-best-practices-portfolio