

An Ecosystem Diversity Planning Process for Forest Management

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ECOSYSTEM
MANAGEMENT
RESEARCH
INSTITUTE

Forest Management Objectives

- **Ecological**
 - **Biodiversity**
- **Economic**
 - **Forest Products**
 - **Other Resources**
- **Social**
 - **Aesthetic**
 - **Other Uses and Values**

Forest Management Planning

- **Needs an approach that can integrate the different objectives in an effective, efficient, and comprehensive manner**
- **An ecosystem-based approach is the best option**

Biodiversity

- **Biodiversity is the landscape, ecosystems, species, and genetics that are native to an area**
- **Humans have interacted with biodiversity- but major recent human alterations of landscapes are considered impacts to biodiversity**

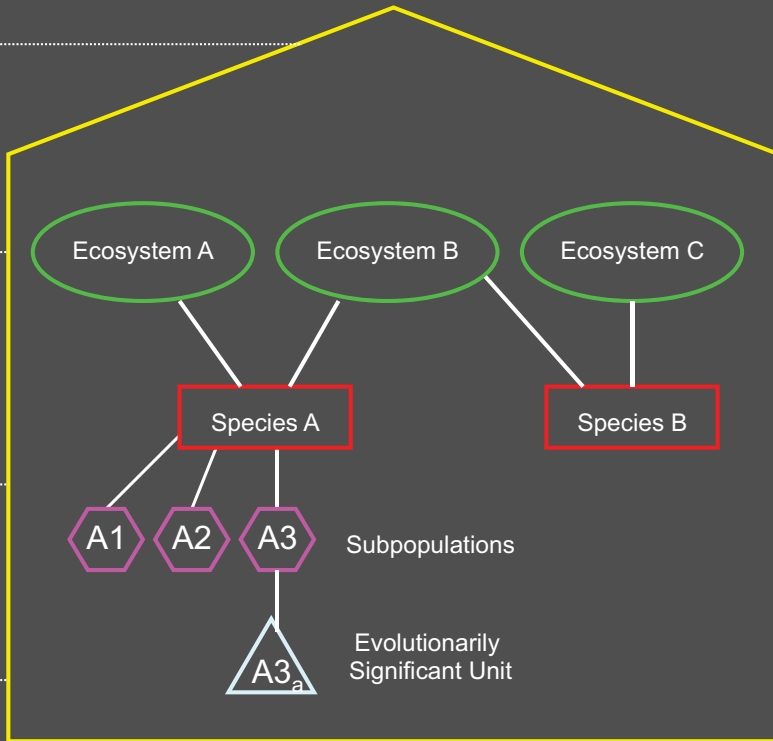
Hierarchical Organization

Landscape Level.....

Ecosystem Level.....

Species Level.....

Genetic Level.....



Premise

- **Biodiversity depends upon the array of native ecosystems that have comprised the landscape**
- **Strategy: maintain an appropriate level of representation of all of the native ecosystems of the area**

Goals

- **Provide for appropriate ecosystem amounts and distributions across landscape (landscape level)**
- **Provide appropriate composition, structure, and processes for each identified ecosystem (ecosystem level)**
- **Provide for resource utilization consistent with these first two goals**

Species Management

- Species will continue to require management, however, a focus on ecosystem diversity will address the biggest concern- providing for the habitat needs of all species.



Identifying Native Ecosystem Diversity

- **Establishes baseline**
 - **Cumulative effects**
- **Identifies ecosystems, their characteristics, and processes**
 - **Reference for setting representation objectives**

Challenges of Ecosystem Diversity



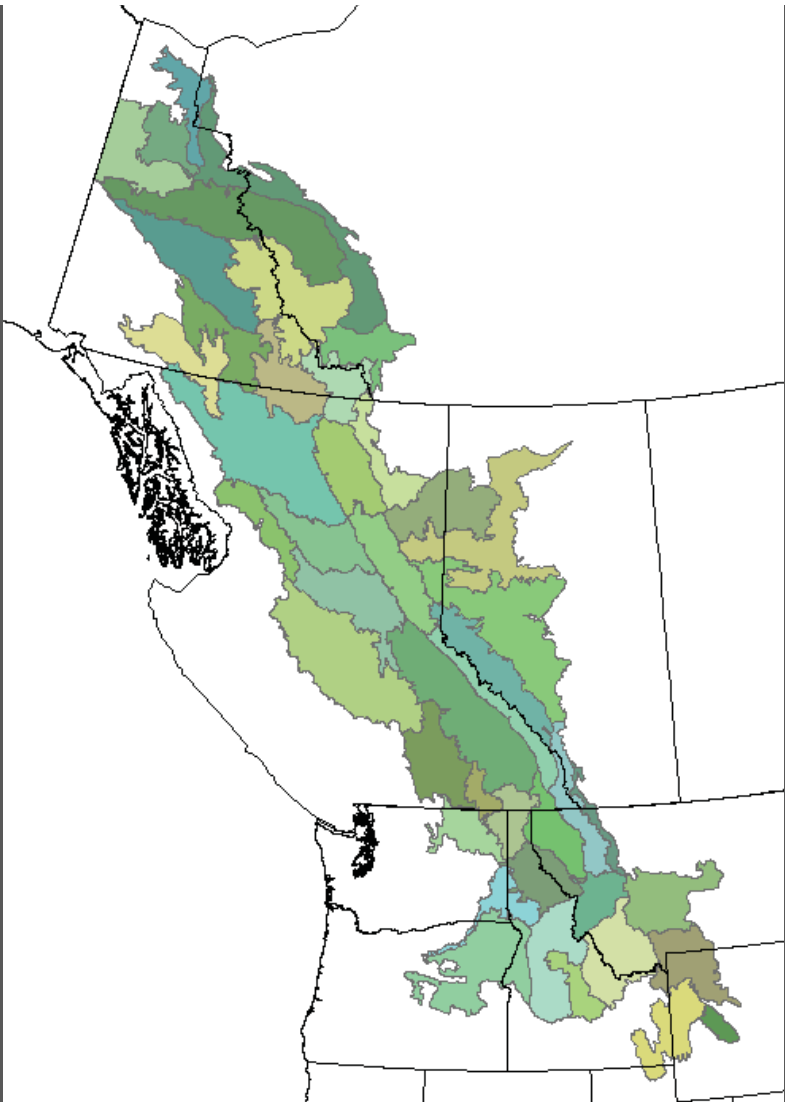
- Ecosystems are not as easily recognized as species
- Scale issues are critical
- Appropriate attention to detail must be balanced with practical limits to application

Ecosystem Diversity Process Steps

- **Step 1. Delineate planning landscape**
- **Step 2. Characterize ecosystem diversity**
- **Step 3. Quantify reference conditions**
- **Step 4. Quantify existing conditions**
- **Step 5. Set management goals**
- **Step 6. Check representation goals**

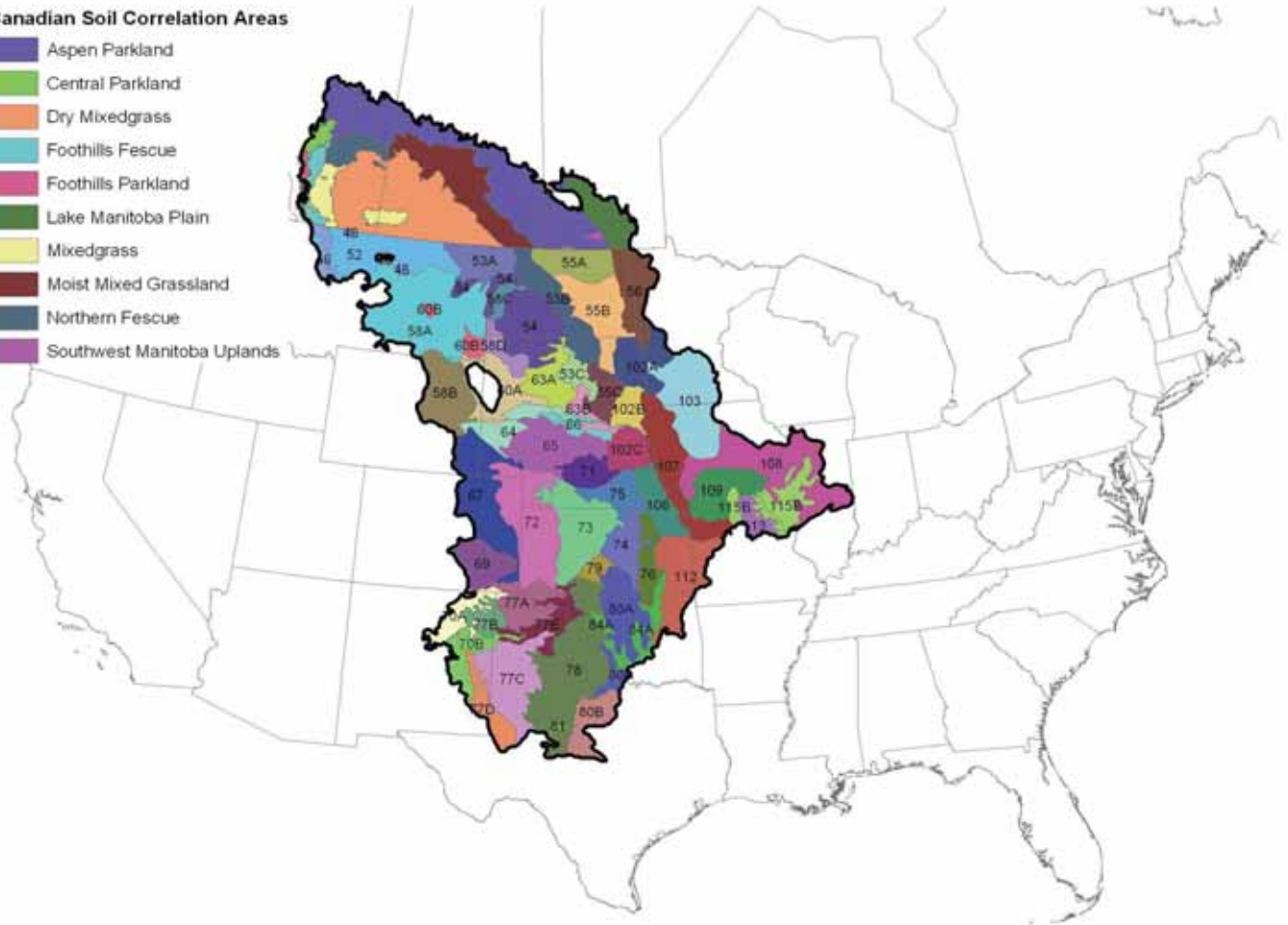
1. Delineate Landscape

- **Landscape should be large**
- **But not too large**
- **Use geo-climatic boundaries where possible to reduce variability in ecosystem diversity**

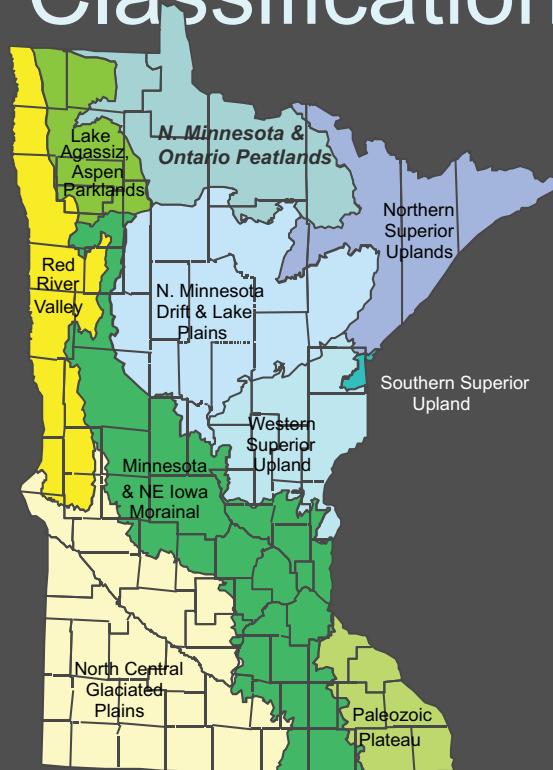


Canadian Soil Correlation Areas

- Aspen Parkland
- Central Parkland
- Dry Mixedgrass
- Foothills Fescue
- Foothills Parkland
- Lake Manitoba Plain
- Mixedgrass
- Moist Mixed Grassland
- Northern Fescue
- Southwest Manitoba Uplands



Ecological Classification System



Section

2. Characterize ecosystem diversity

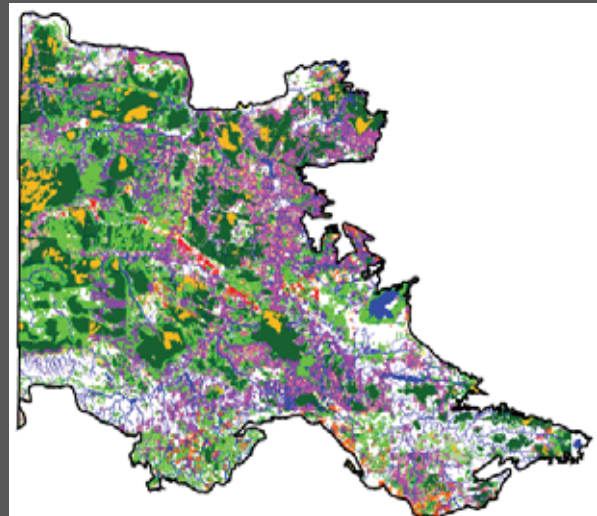
- **Ecosystem diversity has 2 primary drivers:**
 - **Ecological sites- abiotic features**
 - **Disturbance regimes**
- **The combination of ecological sites and responses to disturbance produced the native ecosystem diversity within each landscape**

Ecological Site Classification

- **Many possible classifications**
- **Scale considerations- the right number of units**
- **Examples in terrestrial systems:**
 - **Manitoba Ecosite Descriptions**
 - **Habitat types for North Central Minnesota**

Mapping Ecological Sites

- Data layers used to map habitat type classes:
 - landform
 - soil associations
 - slope
 - topography
 - surficial geology
 - vegetation



Forest Ecosystem Disturbances



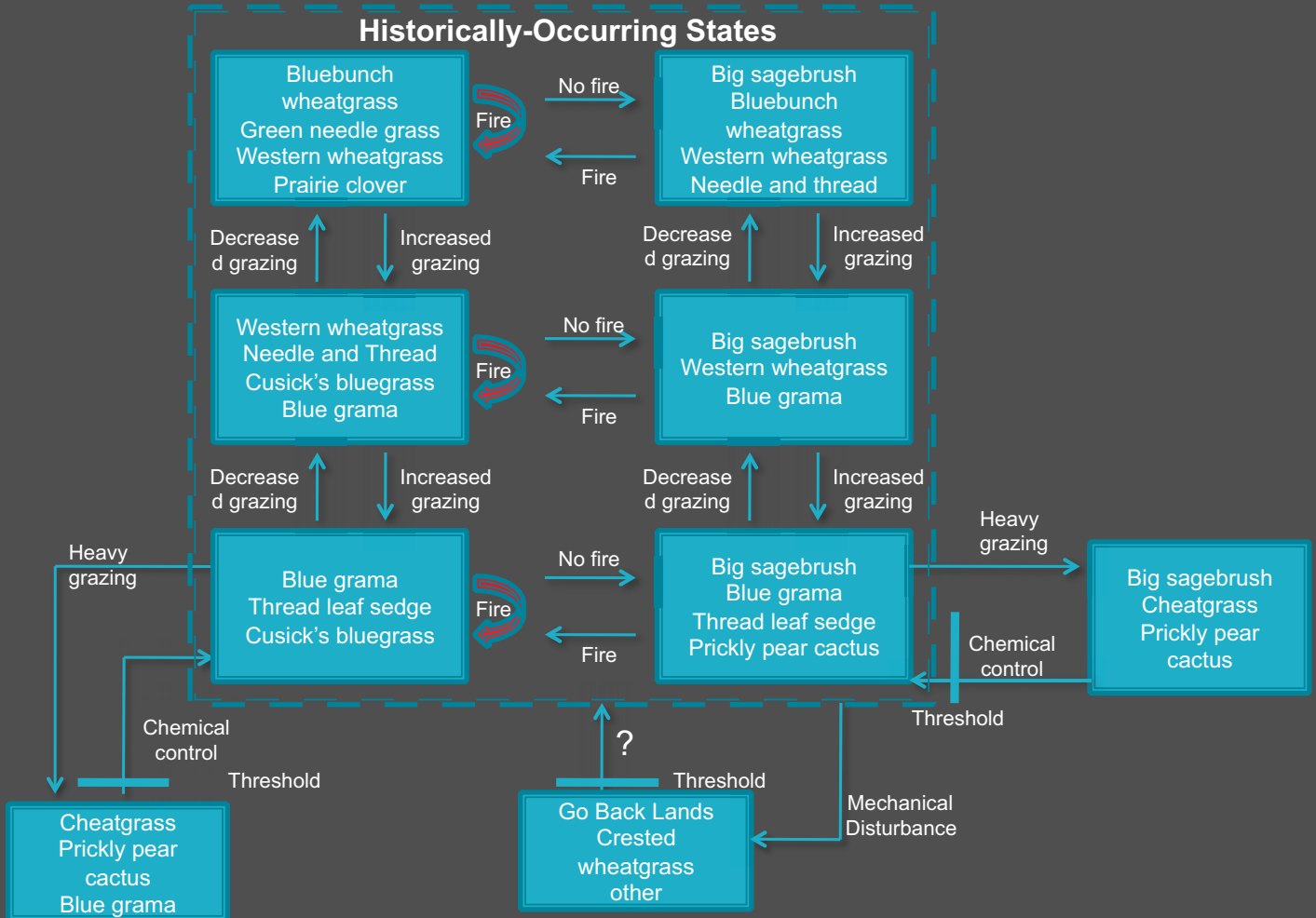
- Diseases/insects
- Shade Tolerance
- Windthrow
- Fire

Describing Disturbance Responses

- **Understanding natural disturbance responses to define reference conditions**
- **Anthropogenic disturbances can be added to understand current and future conditions**
- **Provides a basis for predicting future conditions including possible effects of climate change**

Northern Rolling High Plains MLRA 58B, 10-14" Precipitation Zone
Loamy Ecological Site State and Transition Model

Historically-Occurring States



Ecosystem Diversity Matrix (EDM)

- **Conservation planning tool that classifies ecosystems according to ecological site and response to natural disturbances.**
- **Allows for display of cumulative changes to ecosystem diversity**

Ecosystem Diversity Matrix (simplified)

| Habitat Type Class | | | | |
|--|-----------|-----------------|----------------|------------|
| VEGETATION GROWTH STAGE | Dry Fir | Rich, Moist Fir | Wet Fir/ Cedar | Wet Spruce |
| Seedling/Sapling <i>Shade Intolerant</i> } Small Tree } Medium Tree } Large Tree Small Tree } Medium Tree } <i>Shade Tolerant</i> Large Tree } Old Growth } | Ecosystem | | | |

ECOSYSTEM DIVERSITY MATRIX - FLATHEAD VALLEY ECOREGION

Upland Forested Systems of the Fortine Unit, Fortine District, Kootenai National Forest

| VEGETATION STRUCTURAL STAGES | ENVIRONMENTAL GRADIENT OF ECOLOGICAL SITES (POTENTIAL NATURAL COMMUNITIES) | | | | | | | | | | | | | | | | | | | | | |
|---|--|---|----------------------------------|--|----------------------------------|---|--------------------------------------|-------------------------------------|------------------------------------|------------------------------------|--|--|-------|------|-------|-------|-------|------|-------|---|-------|---|
| | VR11 Moist, Dry Pachystima Roughleaf Douglasfir | VR12 Moist, Dry Douglas Fir/White Fir | VR13 Cool Moist Douglasfir | VR14 Moist Douglas Fir/White Fir | VR15 Cool, Moist Grand Fir | VR16 Moist Mt. Hemlock/W. Red Cedar | VR17 Moist, Mild Subalpine Fir | VR18 Moist, Dry Subalpine Fir | VR19 Cool, Dry Subalpine Fir | VR20 Cool, Dry Subalpine Fir | VR21 Cool Sub-alpine Fir Meadow Pine | VR22 Cool Sub-alpine Fir Meadow Pine | | | | | | | | | | |
| GRASSFORD SCRUB | [Table content: Soil moisture, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| SEEDLING/SAFLING | [Table content: Soil moisture, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| POLE | [Table content: Soil moisture, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| <i>Stand conditions/structure FREQUENTLY influenced by short-lived tree regimes</i> | [Table content: Stand characteristics, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| MEDIUM TREES | [Table content: Stand characteristics, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| LARGE TREES | [Table content: Stand characteristics, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| VERY LARGE TREES | [Table content: Stand characteristics, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| <i>% VR19 by Historical Disturbance Regime</i> | [Table content: Historical disturbance regimes] | | | | | | | | | | | | | | | | | | | | | |
| <i>Stand conditions/structure FREQUENTLY influenced by long-lived tree regimes</i> | [Table content: Stand characteristics, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
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| VERY LARGE TREES | [Table content: Stand characteristics, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| OTHER | [Table content: Stand characteristics, tree cover, species composition] | | | | | | | | | | | | | | | | | | | | | |
| TOTAL ACRES: | Kootenai Nat. Forest | Fortine Unit | 31381 | 57 | 416262 | 1433 | 74196 | 1178 | 27631 | 587 | 27133 | 113 | 79467 | 1519 | 63348 | 15227 | 29491 | 3422 | 96263 | 0 | 50614 | 0 |

LEGEND

Soil moisture regimes: [Color key]

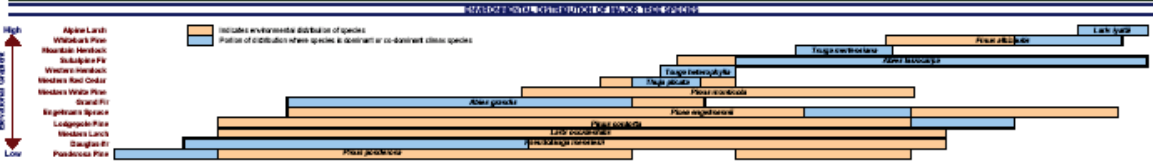
Tree cover regimes: [Color key]

Species composition: [Color key]

Structural Stages:
 Grassford/Scrub < 5' dbh
 Seedling/Safling 0.1 - 5.8' dbh
 Pole 5.9 - 9.0' dbh
 Medium Tree 9.1 - 15.0' dbh
 Large Tree 15.1 - 18.9' dbh
 Very Large Tree > 19.0' dbh

Tree Species:
 MSR - Sitka spruce
 HSL - Sitka spruce
 LDC - Larch + Sitka spruce
 LAL - Larch only
 PSL - Picea canadensis
 HBL - Picea engelmannii
 PND - Picea canadensis
 PDE - Picea canadensis
 PSE - Pseudotsuga canadensis
 TSL - Thuja occidentalis
 TSH - Thuja heterophylla
 TSW - Thuja sitchensis

| VR11 | VR12 | VR13 | VR14 | VR15 | VR16 | VR17 | VR18 | VR19 | VR20 | VR21 | VR22 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| [Species] | [Species] | [Species] | [Species] | [Species] | [Species] | [Species] | [Species] | [Species] | [Species] | [Species] | [Species] |



Reference: [Ecological Community Index - Catalogue of Life](#)

Vegetation Program Unit (VPM) Habitat Type Codes

For vegetation information consult this:

- Halls, J.M. et al. 2002. Performance measures for ecosystem management and ecological sustainability. The Western Forestry Technical Report 02-103.
- Halls, J.M. et al. 1999. Using a constraint approach with response assessment for ecological management. WOOD Tech. Rep. 2002-205-209.
- Halls, J.M. et al. 2000. An ecological framework for planning for forest health. J. Sustainable Forew. 23(2):287-301.
- Vegetation Program Unit (VPM) Habitat Type Codes. 2009. Kootenai National Forest, U.S. Dept. of Agric., U.S. Forest Service, Northern Region.
- Halls, J.M. et al. 1997. Forest health indicators and their use in forest management. USDA Forest Service, Northern Region.
- Vegetation Program Unit (VPM) Habitat Type Codes and their use in forest management. 2009. Kootenai National Forest, U.S. Dept. of Agric., U.S. Forest Service, Northern Region.
- Palmer and Bishop. 1987. Fire ecology of Mountain west forested species. U.S. Dept. Agric., U.S. Forest Service, Northern Region.
- W.M. 2002. Fire regime database for U.S. Forest Service. Page 1.



SELECTED FIRE SEVERITY RANGES - PLANNED STAND ESTABLISHMENT
 Stand Replace/ Mix-Severity of the Forest Unit, Stand Status, Stand Age, Stand Type

**Stand Replace/ Mix-Severity
100-300 yr return interval**

| | |
|------------------------------|---|
| <i>Pseudotsuga mensiesii</i> | 0 |
| <i>Larix occidentalis</i> | |
| <i>Picea engelmannii</i> | |
| <i>Pinus contorta</i> | |

**Stand Replace/ Mix-Severity
110-340 yr return interval**

| | |
|------------------------------|-----|
| <i>Pseudotsuga mensiesii</i> | 248 |
| <i>Larix occidentalis</i> | |
| <i>Pinus contorta</i> | |
| <i>Tsuga heterophylla</i> | |

**Stand Replace/ Mix-Severity
120-300 yr return interval**

| | |
|------------------------------|------|
| <i>Pseudotsuga mensiesii</i> | 1302 |
| <i>Larix occidentalis</i> | |
| <i>Pinus contorta</i> | |
| <i>Picea engelmannii</i> | |

| | |
|------------------------------|----|
| <i>Pseudotsuga mensiesii</i> | 38 |
| <i>Larix occidentalis</i> | |
| <i>Picea engelmannii</i> | |
| <i>Pinus contorta</i> | |

| | |
|------------------------------|---|
| <i>Pseudotsuga mensiesii</i> | 0 |
| <i>Larix occidentalis</i> | |
| <i>Thuja plicata</i> | |
| <i>Tsuga heterophylla</i> | |

| | |
|------------------------------|------|
| <i>Pseudotsuga mensiesii</i> | 1140 |
| <i>Larix occidentalis</i> | |
| <i>Pinus contorta</i> | |
| <i>Picea engelmannii</i> | |

| | |
|------------------------------|----|
| <i>Abies grandis</i> | 47 |
| <i>Pseudotsuga mensiesii</i> | |
| <i>Picea engelmannii</i> | |
| <i>Larix occidentalis</i> | |

| | |
|---------------------------|-----|
| <i>Tsuga heterophylla</i> | 818 |
| <i>Abies grandis</i> | |
| <i>Thuja plicata</i> | |
| <i>Abies lasiocarpa</i> | |

| | |
|------------------------------|------|
| <i>Pseudotsuga mensiesii</i> | 5643 |
| <i>Abies lasiocarpa</i> | |
| <i>Picea engelmannii</i> | |
| <i>Tsuga mertensiana</i> | |

3. Reference Conditions

- **Quantify the variation in amounts of each ecosystem within an ecological site for the landscape over a defined past timeframe**

SIMPPLLE Model

- Developed by the USFS
- Spatially explicit landscape-scale model
- Simulates vegetation change caused by disturbance
- Uses include simulations of historical & future conditions

SIMulating
Patterns and
Processes at
Landscape
scaLES



ECONOMIC DIVERSITY INDEX - FLATHEAD VALLEY ECONOMIC
2014-2015 Economic Report - Flathead Valley Economic Development Authority

| Economic Sector | Year | | | | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| Manufacturing | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Construction | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Retail | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Healthcare | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Education | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Professional Services | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Government | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Finance | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Information | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Arts and Entertainment | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Real Estate | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Transportation | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Other | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

Historical Range of Variability

| | | |
|-----------------|------------------|------------------|
| 1-8 (6.51) | 2-44 (20.55) | 10-45 (22.83) |
| 2-19 (7.87) | 12-26 (21.69) | 12-26 (24.09) |
| 9-31 (17.45) | 5-23 (19.2) | 7-21 (14.52) |
| 14% | 31% | 28% |

4. Quantify Existing Conditions

- **Landscape-**
 - **Mapping of existing ecosystems**
- **Ecosystem-**
 - **Determining current composition and structure**

Compare Reference to Existing Conditions

- **Landscape level-**
 - **Changes in amounts of ecosystems**
- **Ecosystem level**
 - **Changes in compositions, structures, process**
 - **Occurrence of exotic species**



- $\leq 10\%$ Historical
- $> 10\%$ but $\leq 30\%$ Historical
- $> 30\%$ but $\leq 100\%$ Historical
- $> 100\%$ Historical

| Stand Replace/ Mix-Severity 100-300 yr return interval | Stand Replace/ Mix-Severity 110-340 yr return interval | Stand Replace/ Mix-Severity 120-300 yr return interval |
|--|--|---|
| <i>Pseudotsuga mensiesii</i> 0 <i>Larix occidentalis</i> <i>Picea engelmannii</i> <i>Pinus contorta</i> | <i>Pseudotsuga mensiesii</i> 248 <i>Larix occidentalis</i> <i>Pinus contorta</i> <i>Tsuga heterophylla</i> | <i>Pseudotsuga mensiesii</i> 1302 <i>Larix occidentalis</i> <i>Pinus contorta</i> <i>Picea engelmannii</i> |
| <i>Pseudotsuga mensiesii</i> 38 <i>Larix occidentalis</i> <i>Picea engelmannii</i> <i>Pinus contorta</i> | <i>Pseudotsuga mensiesii</i> 0 <i>Larix occidentalis</i> <i>Thuja plicata</i> <i>Tsuga heterophylla</i> | <i>Pseudotsuga mensiesii</i> 1140 <i>Larix occidentalis</i> <i>Pinus contorta</i> <i>Picea engelmannii</i> |
| <i>Abies grandis</i> 47 <i>Pseudotsuga mensiesii</i> <i>Picea engelmannii</i> <i>Larix occidentalis</i> | <i>Tsuga heterophylla</i> 818 <i>Abies grandis</i> <i>Thuja plicata</i> <i>Abies lasiocarpa</i> | <i>Pseudotsuga mensiesii</i> 5643 <i>Abies lasiocarpa</i> <i>Picea engelmannii</i> <i>Tsuga mertensiana</i> |

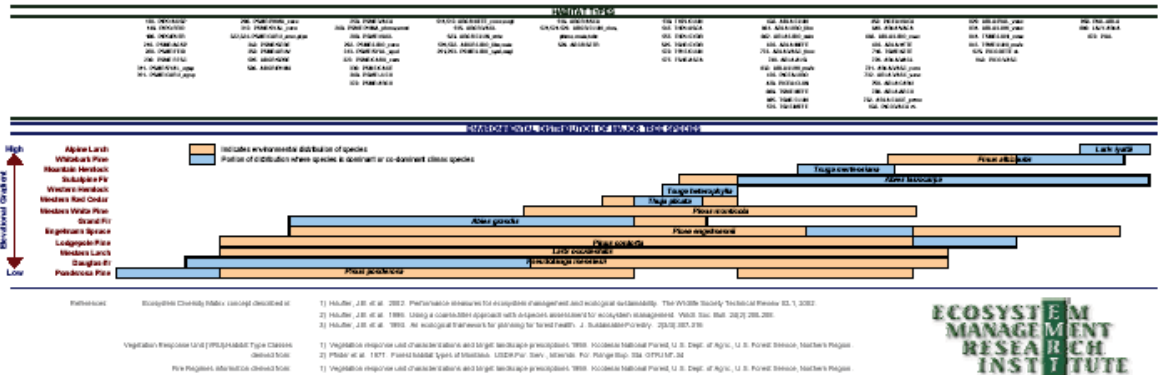
ECOSYSTEM DIVERSITY MATRIX - FLATHEAD VALLEY ECOREGION
Upland Forested Systems of the Fortine Unit, Fortine District, Kootenai National Forest

| VEGETATION STRUCTURAL STAGES | | ENVIRONMENTAL GRADIENT OF ECOLOGICAL SITES (POTENTIAL NATURAL COMMUNITIES) | | | | | | | | | | |
|------------------------------|--|--|---|--|--|--|--|--|--|--|--|--|
| | | WVU1 Moist, Dry Panicum/Chenopod | WVU2 Moist, Dry Douglas/Fir/Red Fir | WVU3 Cool/Hedysium Douglas/Fir | WVU4 Moist, Dry Douglas/Fir/Red Fir | WVU5 Cool, Wet Douglas/Fir | WVU6 Moist M. heterophyllum/Red Cedar | WVU7 Moist, Warm Sedgwick/Fir | WVU8 Moist, Dry Sedgwick/Fir | WVU9 Cool, Dry Sedgwick/Fir | WVU10 Cool, Dry Sedgwick/Fir | WVU11 Cool Sub-alpine/Pine Mudbush/Pine |
| GRASSFORD SCRUB | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| SEEDLING/SAPLING | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| POLE | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| | Standard condition structure FREQUENTLY influenced by | Barred 10-20 yr. return interval | New Initial/ Mixed severity 10-40 yr. return interval | New/Rebilled/Mixed Severity 10-25 yr. return interval | New/Rebilled/High Severity 20-30 yr. return interval | Abundant/High Severity 30-50 yr. return interval | Abundant/High Severity 17-113 yr. return interval | Abundant/High Severity 30-50 yr. return interval | Abundant/High Severity 10-71 yr. return interval | Abundant/High Severity 30-50 yr. return interval | Abundant/High Severity 30-50 yr. return interval | Abundant/High Severity 30-50 yr. return interval |
| MEDIUM TREES | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| LARGE TREES | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| VERY LARGE TREES | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| | % WVI by Historical Disturbance Regime | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| | Standard condition structure FREQUENTLY influenced by | Rarely Disturbed | Rarely Disturbed | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval | Stand Replace/ Abundant/High Severity 100-1000 yr. return interval |
| MEDIUM TREES | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| LARGE TREES | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| VERY LARGE TREES | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| OTHER | | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| TOTAL ACRES: | Kootenai Nat. Forest/ Fortine Unit | 20361/ 57 | 41629/ 463 | 74196/ 1578 | 27831/ 597 | 27133/ 113 | 794067/ 1519 | 633486/ 15227 | 294811/ 3402 | 96063/ 0 | 50616/ 0 | |

LEGEND

Grassford Scrub
0' - 2.0'
Seedling/Sapling 0.1 - 5.0' dbh
Pole 5.1 - 9.0' dbh
Medium Tree 9.1 - 15.0' dbh
Large Tree 15.1 - 18.0' dbh
Very Large Tree > 18.0' dbh

Tree Codes
MBR = mixed grass
MBA = mixed shrub
LAC = Larkspur
LAL = Larkspur
PIL = Pinus
FIR = Fir
HED = Hedysium
SFG = Sedgwick
MHA = M. heterophyllum
MHO = M. heterophyllum
MHO = M. heterophyllum
MHO = M. heterophyllum
MHO = M. heterophyllum



Revised: Ecological Gradient from Ecological Gradient

Vegetation Program Unit (VPU) - Fortine Unit

- 1) Haubert, D. et al. 2002. Performance measures for ecosystem management and ecological sustainability. The Wildlife Society Technical Paper 02, 71, 2002.
- 2) Haubert, D. et al. 1999. Using a condition-based approach with response assessment for ecological management. Wildl. Soc. Bull. 28(2):285,290.
- 3) Haubert, D. et al. 2000. An ecological framework for planning for forest health. J. Suburban/Forestry. 29(3):287,310.
- 4) Vegetation Program Unit (VPU) - Fortine Unit
- 5) Fausch and Broderick. 1987. Fire ecology of Montana wetland species. U.S. Dept. Agric., U.S. Fish & Wildl., N.M. Fish 358. 97(4):221,222.
- 6) Haubert, D. 2002. Fire regime database for U.S. Fish & Wildl. 11.

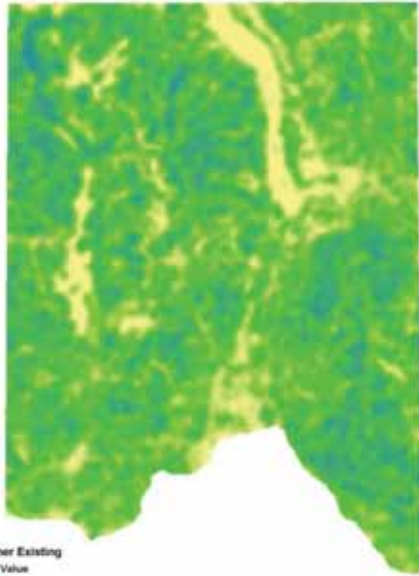


5. Management Recommendations

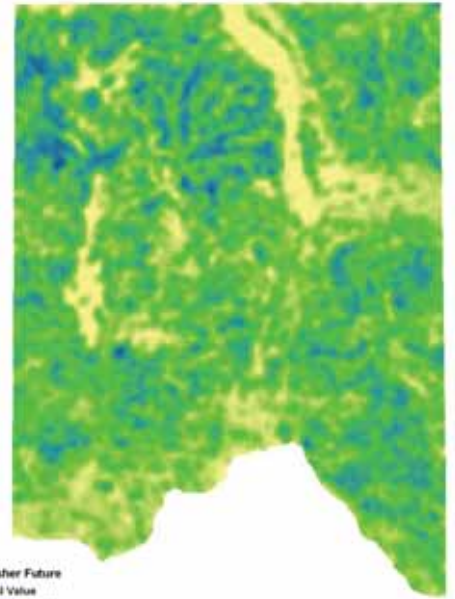
- **Landscape level**
 - **Identify desired amounts and distributions of native ecosystems**
- **Ecosystem level**
 - **Identify desired compositions and structures for representative areas**
- **Guide management prescriptions**

6. Check Representation Goals

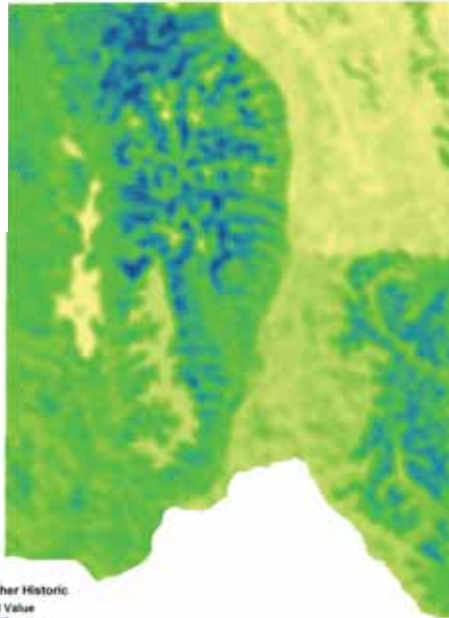
- **Species can be used to check on adequacy of representation**



Fisher Existing
HSI Value
High - 100
Low - 0

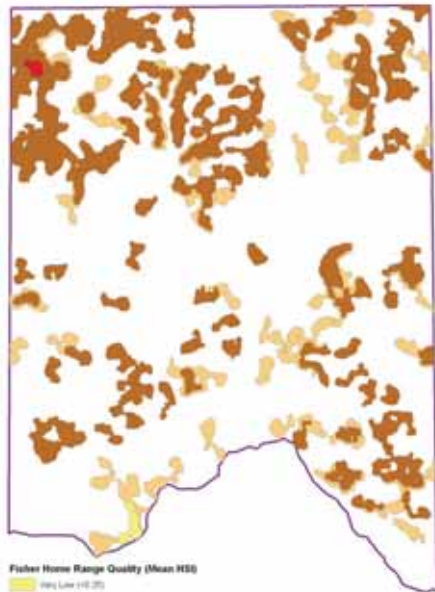


Fisher Future
HSI Value
High - 100
Low - 0

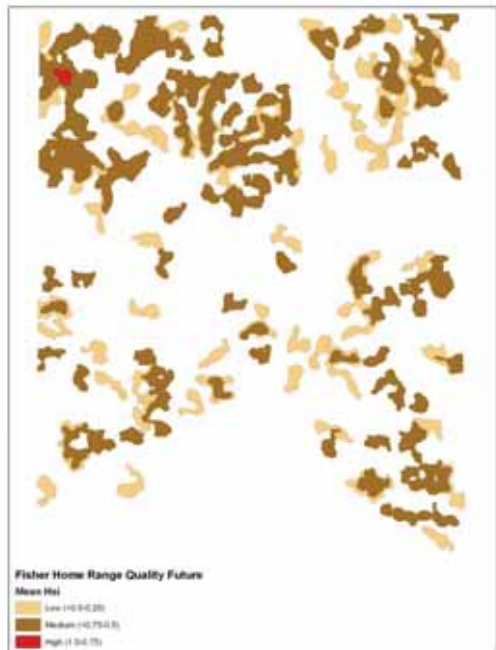


Fisher Historic
HSI Value
High - 100
Low - 0





Fisher Home Range Quality (Mean HSB)
 Mean HSB
 Low (1.0-2.0)
 Medium (2.0-3.0)
 High (3.0-7.0)

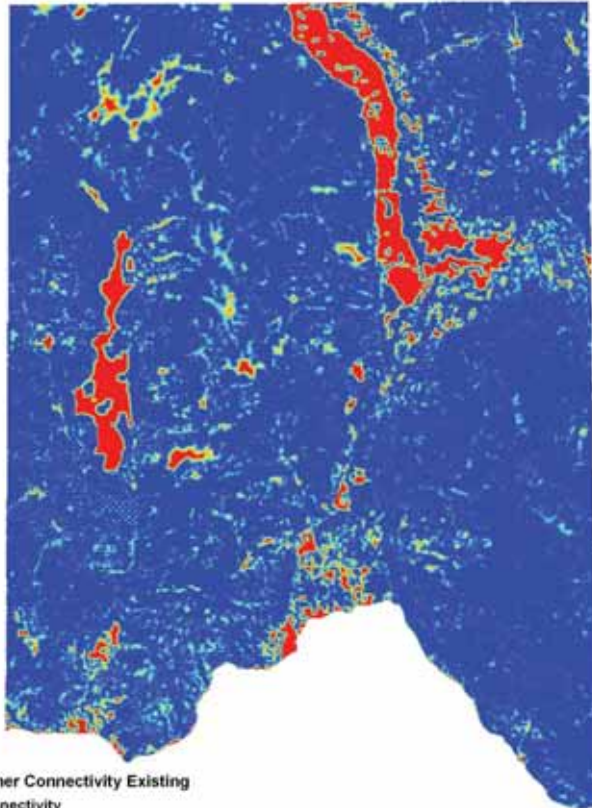


Fisher Home Range Quality Future
 Mean HSI
 Low (1.0-2.0)
 Medium (2.0-3.0)
 High (3.0-7.0)



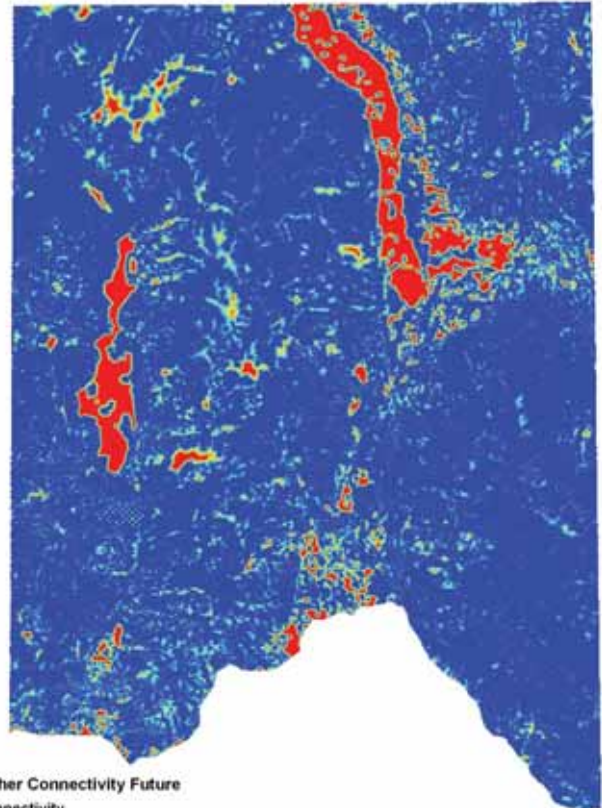
Fisher Home Range Quality HVI
 Mean HVI
 Low (1.0-2.0)
 Medium (2.0-3.0)
 High (3.0-7.0)





Fisher Connectivity Existing

Connectivity



Fisher Connectivity Future

Connectivity



Summary

- **Ecosystem diversity is a cornerstone for conservation of biodiversity**
- **It can be effectively and efficiently characterized, mapped, and used to set management objectives**
- **An ecosystem-based process has been used to develop management plans for numerous areas and for all types of ecosystems**
- **It allows for the integration of ecological, social, and economic objectives**