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GEODESY AND CARTOGRAPHY



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RESEARCH INSTITUTE OF
GENERAL AND EXPERIMENTAL
BIOLOGY

STATE AND TRANSITION MODELS OF MONGOLIAN RANGELANDS

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4TH EDITION

FOREWORD

Rangelands are the source of rural prosperity, clean air and water, and other goods and services across Mongolia. Management of rangeland health is paramount considering the impacts of increasing livestock numbers, climate change, and land conversion.

We are happy to deliver to you an updated edition of the "STATE AND TRANSITION MODELS OF MONGOLIAN RANGELANDS". The catalogue describes the reference (healthy) and alternative states for specific types of soils (ecological site groups) within ecoregions of Mongolia. The "states" (large boxes) represent large changes in rangeland conditions that can be difficult to reverse and "community phases" (smaller boxes within states) represent more easily-reversed changes in vegetation within states. Transitions between states and community phases interpreted as degradation (red arrows) and restoration (green arrows) relate to specific management actions that can be used to prevent or reverse degradation over time. The models are based on field data and expert knowledge, including key indicator species and potential productivity, as well as recommendations for carrying capacity.

Models were developed using long-term data collected by Green Gold project and efforts by specialists of the Information and Research Institute of Meteorology, Hydrology and Environment and Agency for Land Management, Geodesy and

Cartography, and researchers and consultants of the Academy of Sciences of Mongolia. This illustrated catalogue is used for analysis and interpretation of rangeland health monitoring and assessment information, which provides a scientific basis for planning and implementation of resilience-based rangeland management and rangeland use agreements. New studies and monitoring data results are used to develop periodic updates to the models.

In this new edition, the geographical distributions of ecological site groups are described. Traditionally-used degradation levels, in addition to recovery classes, are linked to states and community phases. In order to facilitate broader use of the catalogue, vegetation cover generated by line-transect method is provided in conjunction with the cover percentage by conventional visual estimation. Descriptions of dominant and subdominant species characteristic of each state are also provided, alongside estimated biomass and livestock carrying capacity for each state.

The appropriateness of the revised "STATE AND TRANSITION MODELS OF MONGOLIAN RANGELANDS" for use in rangeland health assessment and monitoring activities and the development and execution of soum rangeland management plans has been certified and formalized by research organizations and other relevant bodies.

Agency for Land Management, Geodesy and Cartography
Information and Research Institute of Hydrology, Meteorology and Environment
Institute of General and Experimental Biology, the Academy of Sciences of Mongolia
Mongolian National Federation of Pasture User Groups
Green Gold-Animal health Project, Swiss Development Cooperation

HOW TO USE STATE AND TRANSITION MODELS

Ecological site group's name: Landform;
soil, rangeland community

1. FESTUCA-FORBS MOUNTAIN STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, FOREST STEPPE

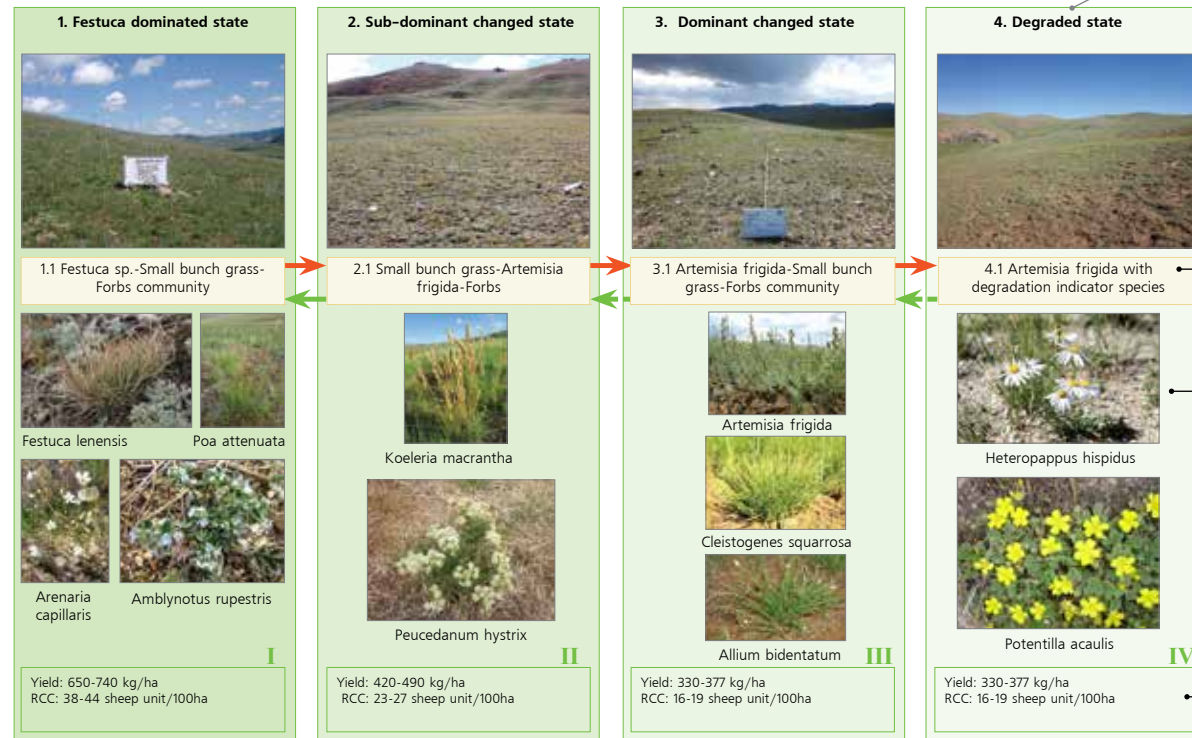
Alternative states rangelands

→ Red arrow:
Transition pathways
between states.

← Green arrow:
Recovery pathways
between states.

← Staked green arrow:
Undefined recovery
pathways

I-IV Recovery classes



Community name

Key indicator species

Expected yield, Resilient carrying capacity

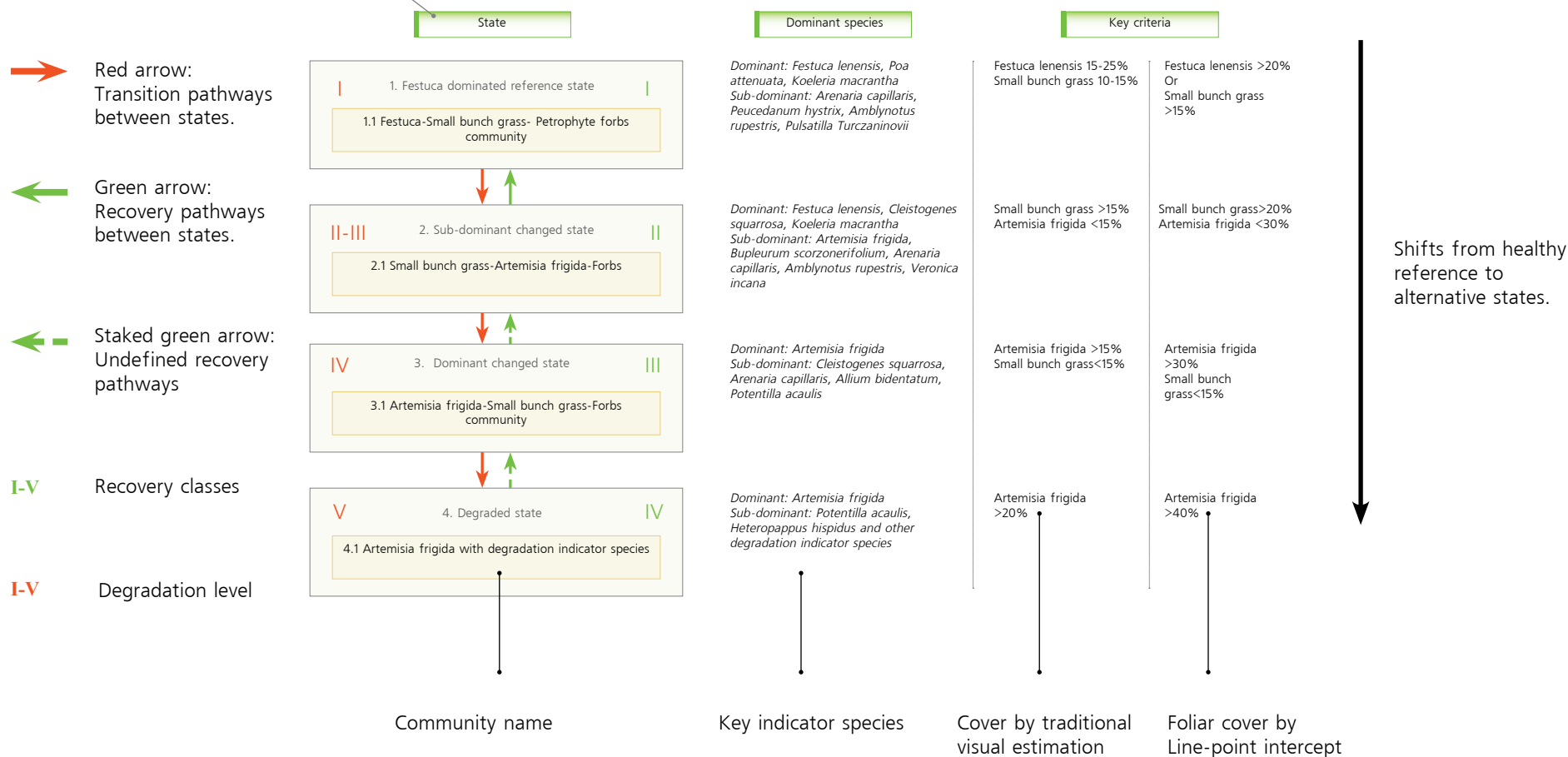
Shifts from healthy reference to alternative states.

HOW TO USE STATE AND TRANSITION MODELS

Ecological site group's name: Landform; soil, rangeland community

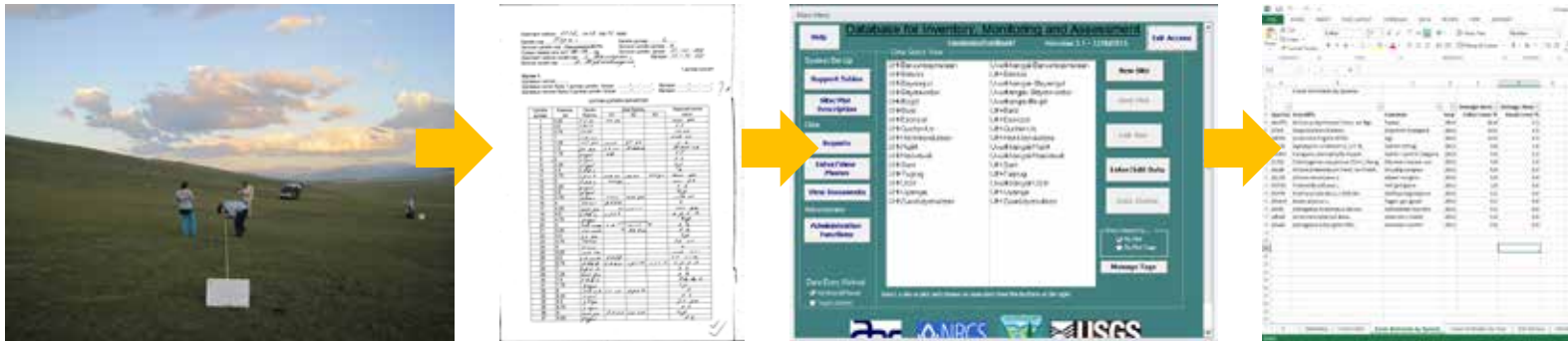
Alternative states rangelands

1. FESTUCA-FORBS MOUNTAIN STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, FOREST STEPPE



SYNERGIES BETWEEN RANGELAND MONITORING AND ASSESSMENT PROGRAMS

Rangeland management system at the NAMEM:



RANGELAND HEALTH OUTLOOK

RESILIENCE BASED RANGELAND MANAGEMENT



Grazing impact monitoring system at the ALAMGC:



RESOLUTIONS ISSUED BY IMPORTANT INSTITUTIONS APPROVING THE STATE AND TRANSITION MODELS AS A MANAGEMENT TOOL


**ГАЗРЫН ХАРИЛЦАА, ГЕОДЕН,
ЗУРАГ ТҮҮВ ГАЗРЫН ДАРГЫН
ТУШААЛ**

2015 оны 05 сарын 22 өдөр
 Дүрэм 2/04

**Сумын газар зохион байгуулалтын
тухайн жилийн төлөвлөгөө боловсруулах
аргачлалд нэмэлт оруулах тухай**

Засгийн газрын агентлагийн эрх зүйн байдлын тухай хуулийн 8.4 дэх хэсэг, Газрын тухай хуулийн 23 дугаар зүйлийн 23.2.8, 23.2.12, тус Газрын даргын даргадх аюулгүйн 2015 оны 05 дугаар сарын 22-ны өдрийн хурлын тэмдэглэлийг тус тус үндэслэн ТУШААХ нь:

ГХГЗЗГ-ын даргын 2010 оны 497 тоот тушаалаар батлагдсан "Сумын газар зохион байгуулалтын тухайн жилийн төлөвлөгөө боловсруулах аргачлал"д дараах нэмэлтийг оруулсугай. Үүнд:

а. Хавсралт дэглээ, "Бэлгээрийн төлөв байдал, өөрчлөлтийн загварыг ашиглах зөвлөмж"

ДАРГА



А.ХҮРЭЛШАГАЙ



0000437


**НАГ УУР ОРЧНЫ ӨННӨЖИЛГЭЭНИЙ
ГАЗРЫН ДАРГЫН
ТУШААЛ**

2015 оны 11 сарын 30 өдөр
 Дүрэм А/161

Загвар, аргачлал ашиглах тухай

Монгол улсын "Засгийн газрын агентлагийн эрх зүйн байдлын тухай" хуулийн 8 дугаар зүйлийн 8.4 дэх заалт, "Ус цаг уур, орчны хяналт шалгалттай тухай" хуулийн 6 дугаар зүйлийн 6.1.1, "Төсвийн тухай" хуулийн 16 дугаар зүйлийн 16.5.4 дэх хэсэг, Газрын даргадх арга зүйн зөвлөлийн 2015 оны 5 дугаар хурлын тэмдэглэлийг тус тус үндэслэн ТУШААХ нь:

- "Экологийн чадавхи дээр суурилсан төлөв байдлын өөрчлөлтийн загвар, аргачлал"-ыг 2018 оны 01 дүгээр сарын 01-ний өдрөөс эхлэн Хөдөө аж ахуйн цаг уурын улсын сүлжээнд нэвтрүүлж, ашигласугай.
- Ус цаг уур, орчны хяналт шалгалттай улсын сүлжээнд хийж байгаа бэлгээрийн төлөв байдлын мониторингийн мэдээллийн санг бэлгээж, "Экологийн чадавхи дээр суурилсан төлөв байдлын өөрчлөлтийн загвар" аргачлалаар мэдээнд боловсруулаж хийж, Монгол орны бэлгээрийн төлөв байдлын тайлан мэдээ гаргаж байхыг Ус цаг уур, орчны судалгаа, мэдээллийн хүрээлэн, Аймаг, нийслэлийн Ус цаг уур, орчны шалгалттай албадад даалгасугай.
- Тушаалын хэрэгжлэлэнд нэмэлт тавьж ажиллахыг тус газрын дэд дарга Б.Баттулга, Ус цаг уур, орчны судалгаа, мэдээллийн хүрээлэнгийн захирал С.Хөдөлмөр, Аймаг, нийслэлийн Ус цаг уур, орчны шалгалттай албаны дарга нэрт үүрэг болгосугай.

ДАРГА



Д.ЦОГ-ОЧИР



0152

**ИНЖЕНЕР УЛААНЫ АКАДЕМИ
ЕРӨНХИЙ БОЛОН СОРЩИЙ
БИОЛОГИЙН ХҮРЭЛЭГИЙН
ЭГДЛИЙН ЗӨВ БУУЛИЙН ХҮРЭЛЭН
ТОГТООЛ**

2014 оны 05 сарын 21 өдөр
 Дүрэм 01

**"Монгол орны бэлгээрийн
төлөв байдал, өөрчлөлтийн загварыг"-ыг
дэглээх тухай**


Ус, цаг уур болон газрын харилцааны систем дээр бэлгээрийн мониторингийн улсын сүлжээг бэлгээжээгээр "Монголын бэлгээр ашиглагчдын аюулгүйн хөдөө"-оос Ногоон алт-Малын эрүүл мэнд төслийн дэмжлэгээр УИДӨИШ, ГНЗЭГ, ИУВА-ийн Ерөнхий болон сорчийн биологийн хүрээлэнгэй хамтран боловсруулсан "МОНГОЛ ОРНЫ БЭЛГЭЭРИЙН ТӨЛӨВ БАЙДАЛ, ӨӨРЧЛӨЛТИЙН ЗАГВАРУУЛ" гарын авчлын зөвлөмжийн эдийн засгийн зөвлөлийн хурлаар хэлэлцэн ТОГТООХ нь:

- "Монгол орны бэлгээрийн төлөв байдал, өөрчлөлтийн загварыг" гарын авчлагч манай орны бэлгээрийн зөвлөлийн 22 бэлгээрийн хэв маяг, тэдгээрийн бэлгээрийн ашиглалтын нөлөөгөөр доройтно, сүргийн үе шатуудыг загварчлан, үе шат бүрийн ургамал бүлэгчлэл, зохиолгоц ургамал, шалгуур үзүүлэлт, зуны дээд ургамал, бэлгээрийн боловсролт давжт төлөв оруулан байна. Тэгшүү загварыг гаргажлан Ногоон Алт төслийн хүрээнд сүүлийн 10 жилийн хүрээнд хийсэн бэлгээрийн экологийн чадавхины судалгаа болон буюу эрдэмт судалгаа хийсэн ургамалын судалгааны үр дүнд суурилж боловсруулсан нь олонийн судалгааны үр дүнд хэргээрүүлэн эрдэмт ашиглах боломжтой, шинэстэй, улааны үндэслэлтэй бүтэн болон хэмжээ үзэгдэй.
- Уг гарын авчлагч орон туйла ургамалын зургийн чимэргийг сайжруулан, хэвлэн нийтлүүлж, бэлгээрийн ургамалын сүргийн чадавхи, давжт нь төлөрүүлэн бэлгээрийн төлөрөгчийн ашиглах зорилгоор бэлгээр зохион байгуулалтад болон бэлгээр ашиглагчдын хэрэгжлэлт шалгуурт боломжтой гэж үзэгдэй.


ДАРГА



Я.АДУЯА



НАРИЙН БҮГЧИЙН
ДАРГА

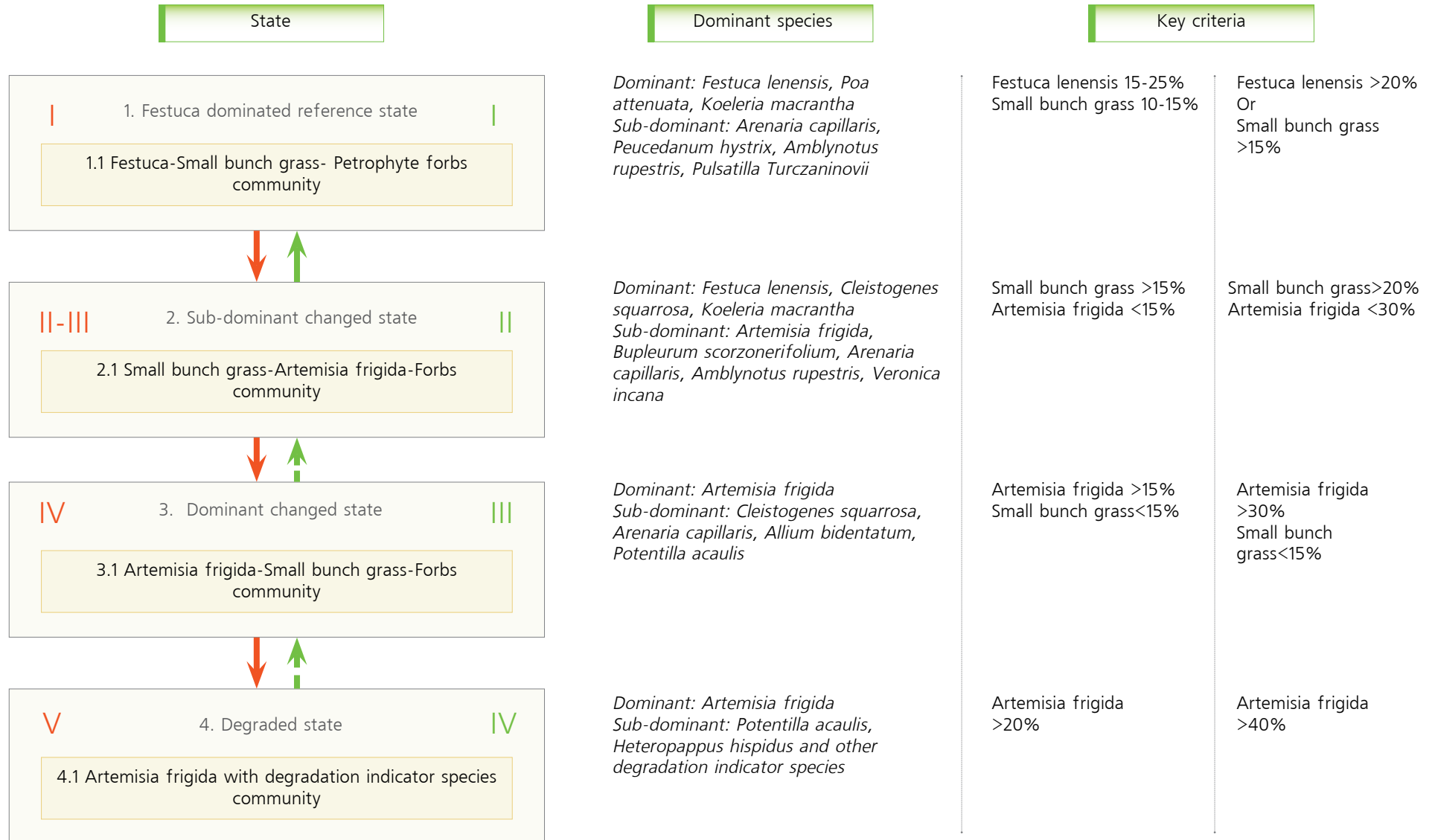


Э.АРИНУЙВОЛЦ



D. Shukh-Aa.Tsgal

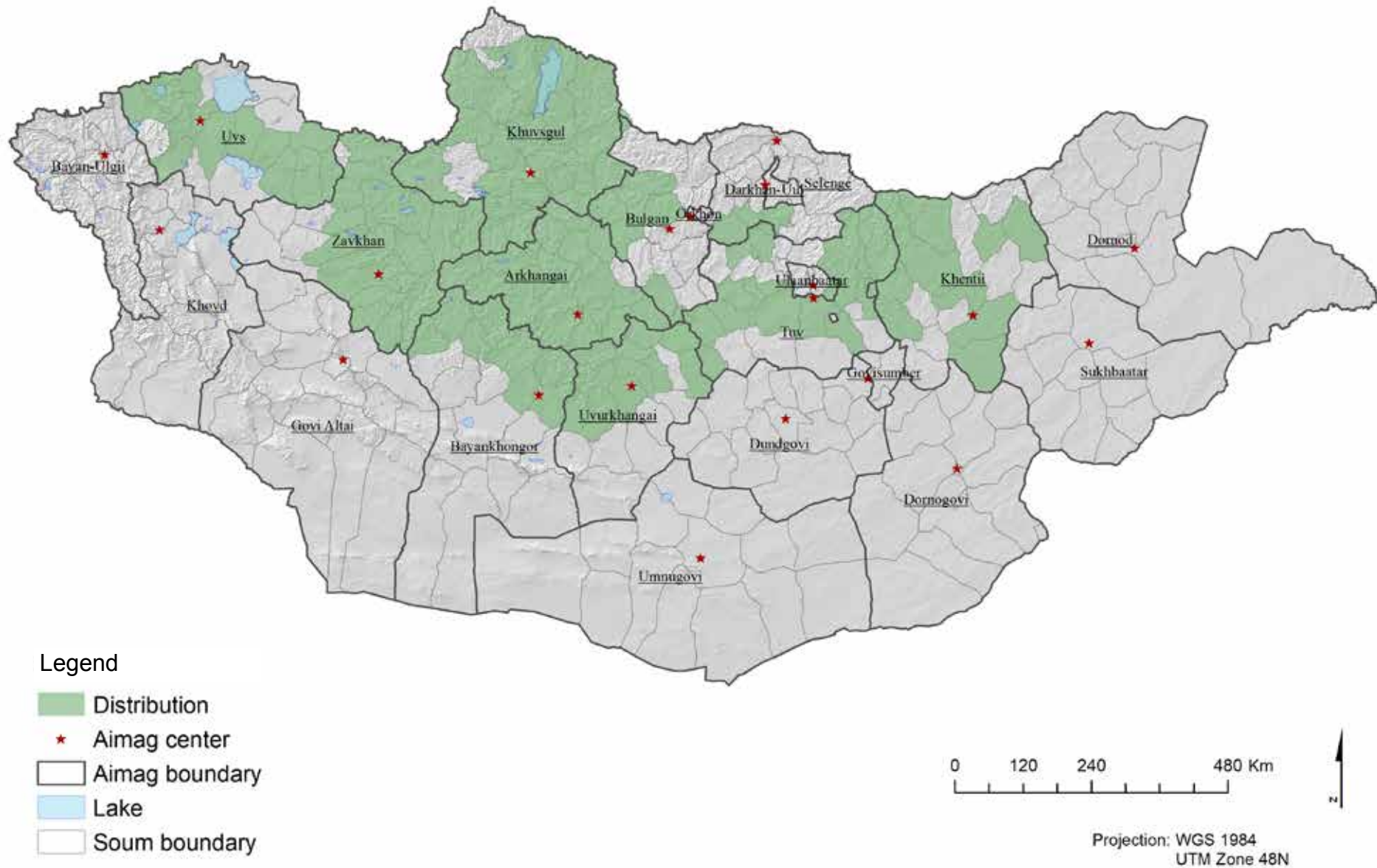
1. FESTUCA-FORBS MOUNTAIN STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, FOREST STEPPE



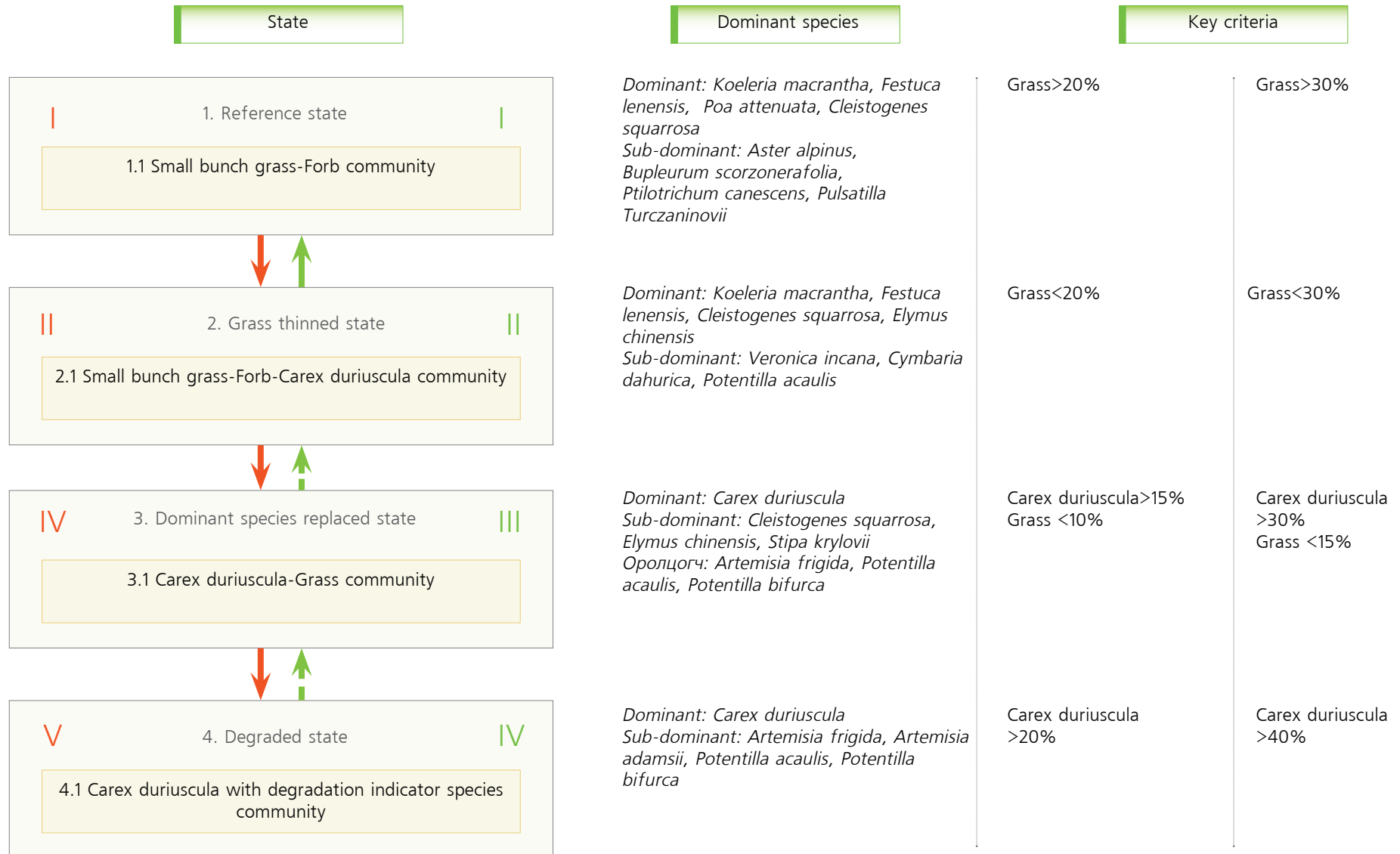
1. FESTUCA-FORBS MOUNTAIN STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, FOREST STEPPE



1. DISTRIBUTION OF FESTUCA-FORBS MOUNTAIN STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, FOREST STEPPE



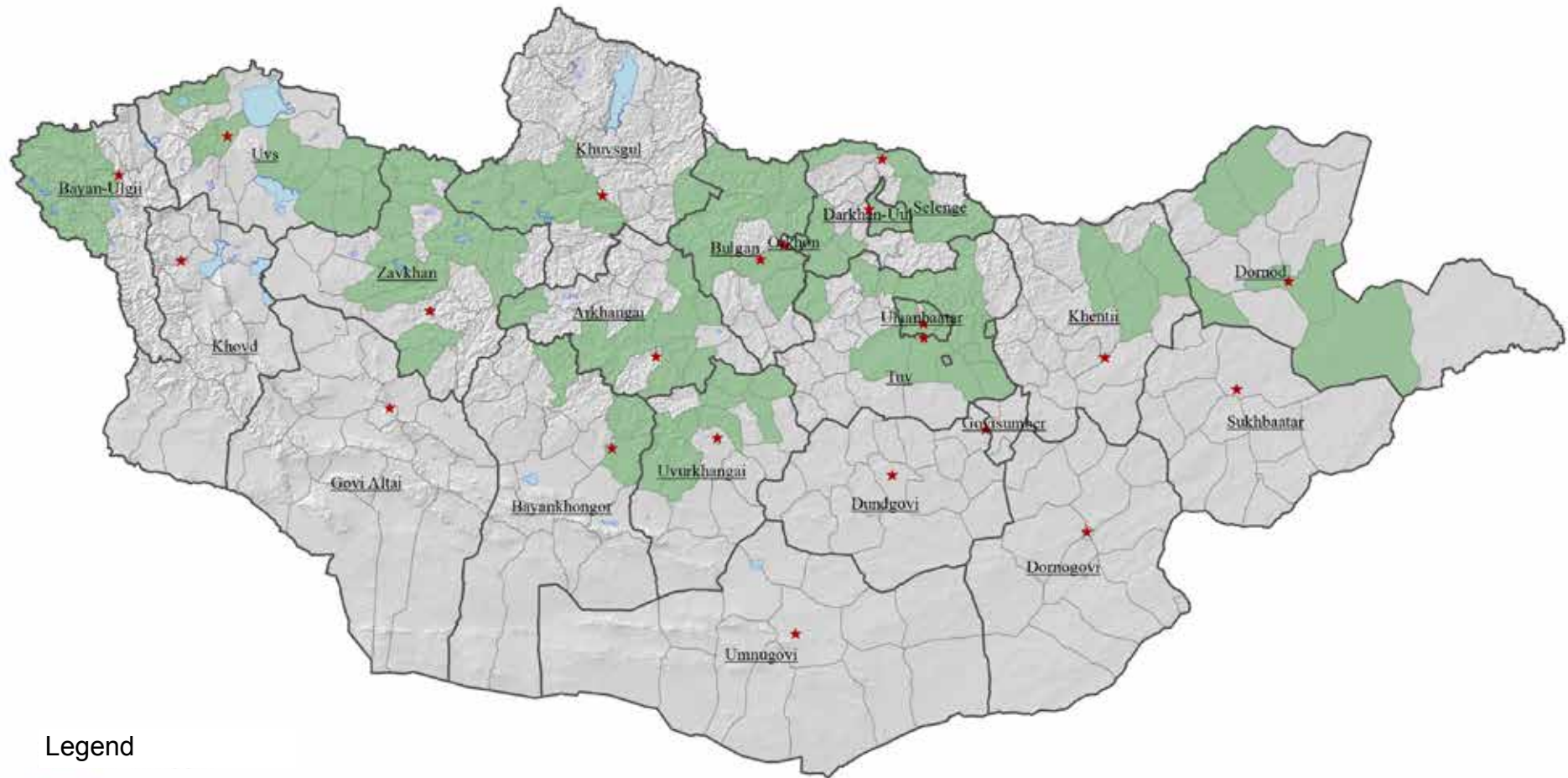
2. SMALL BUNCH GRASS-FORBS MOUNTAIN STEPPE RANGELAND IN LOAMY FAN ESG, FOREST STEPPE



2. SMALL BUNCH GRASS-FORBS MOUNTAIN STEPPE RANGELAND IN LOAMY FAN ESG, FOREST STEPPE

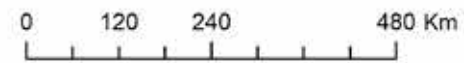


2. DISTRIBUTION OF SMALL BUNCH GRASS-FORBS MOUNTAIN STEPPE RANGELAND IN LOAMY FAN ESG, FOREST STEPPE



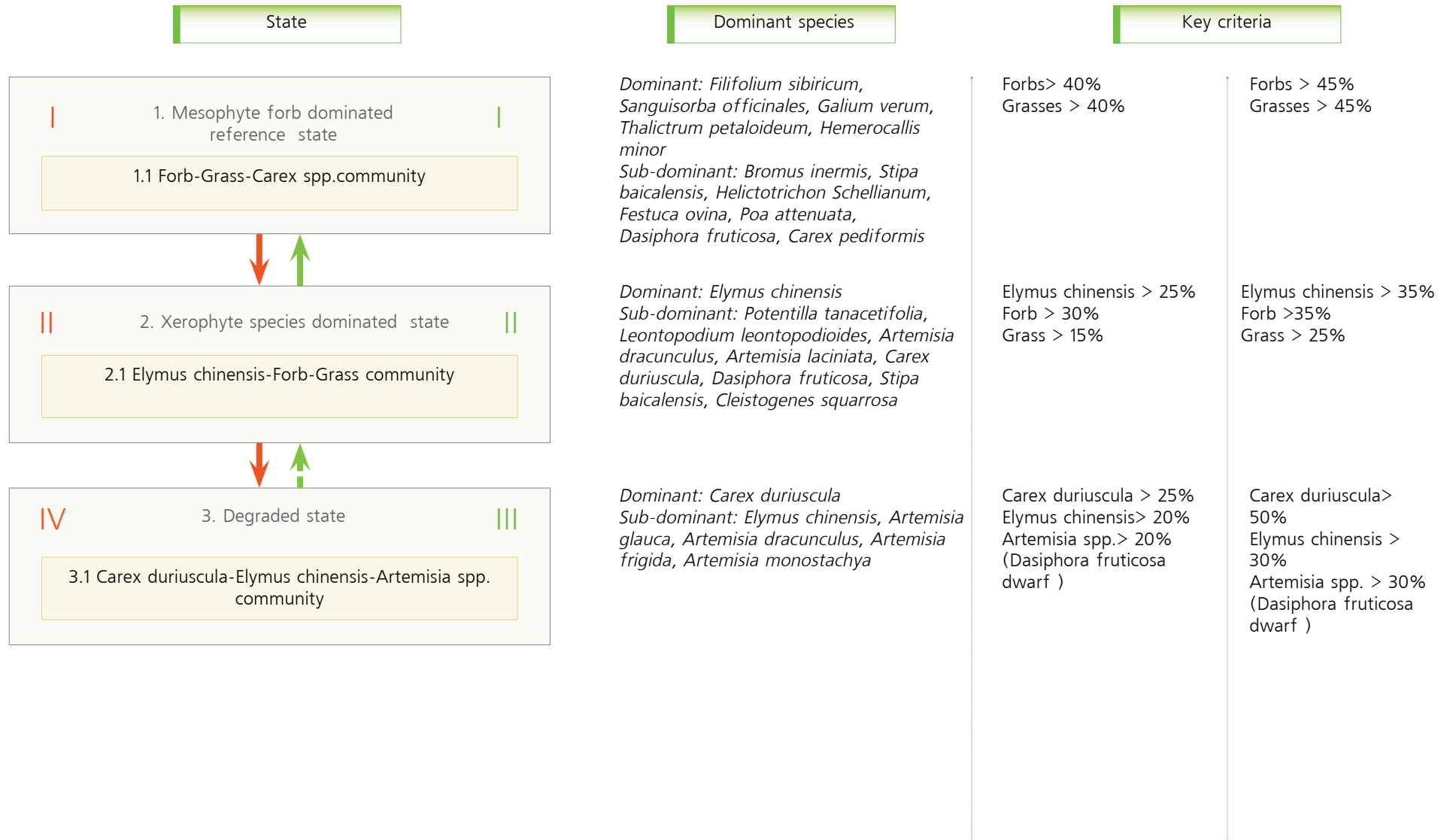
Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

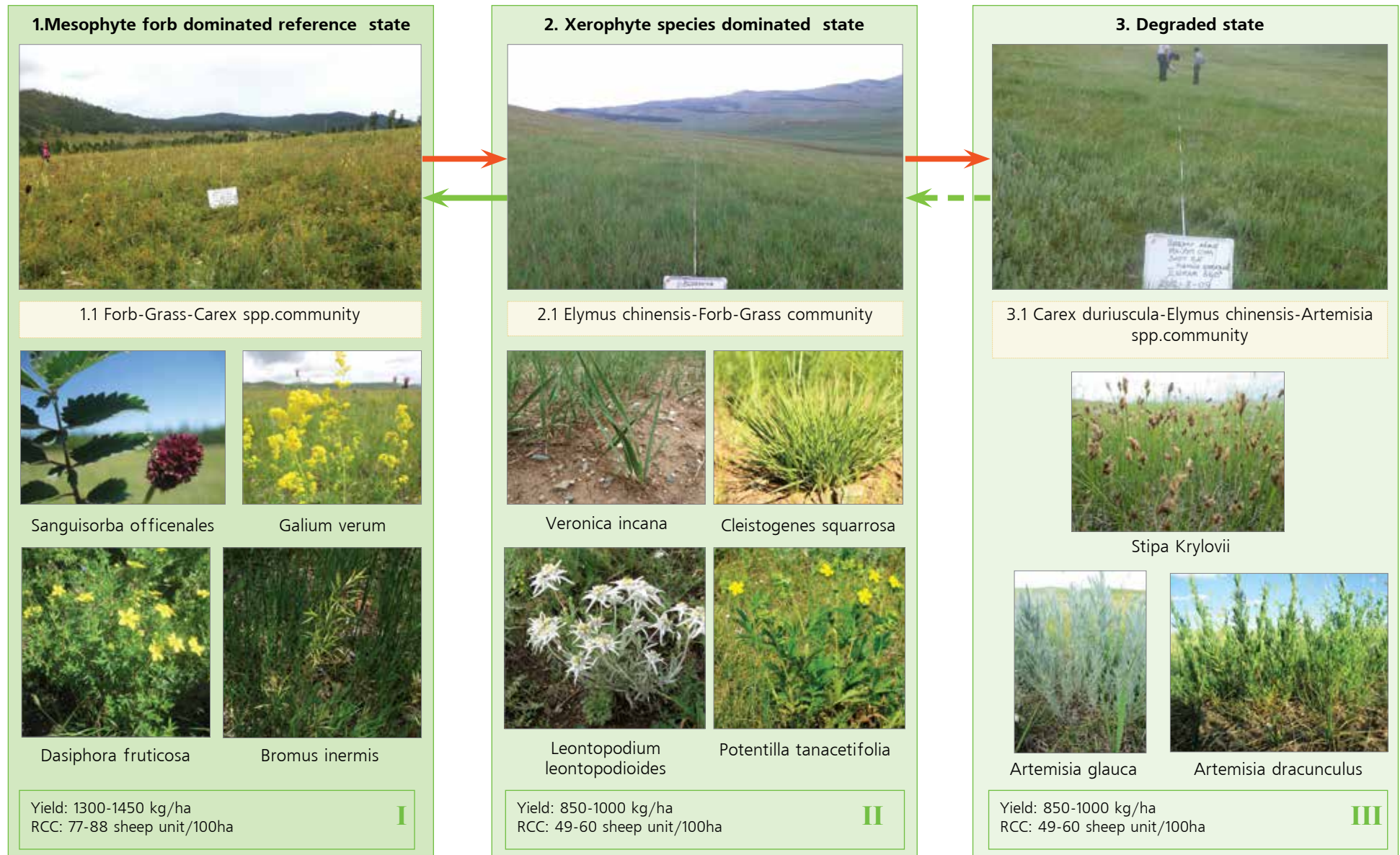


Projection: WGS 1984
UTM Zone 48N

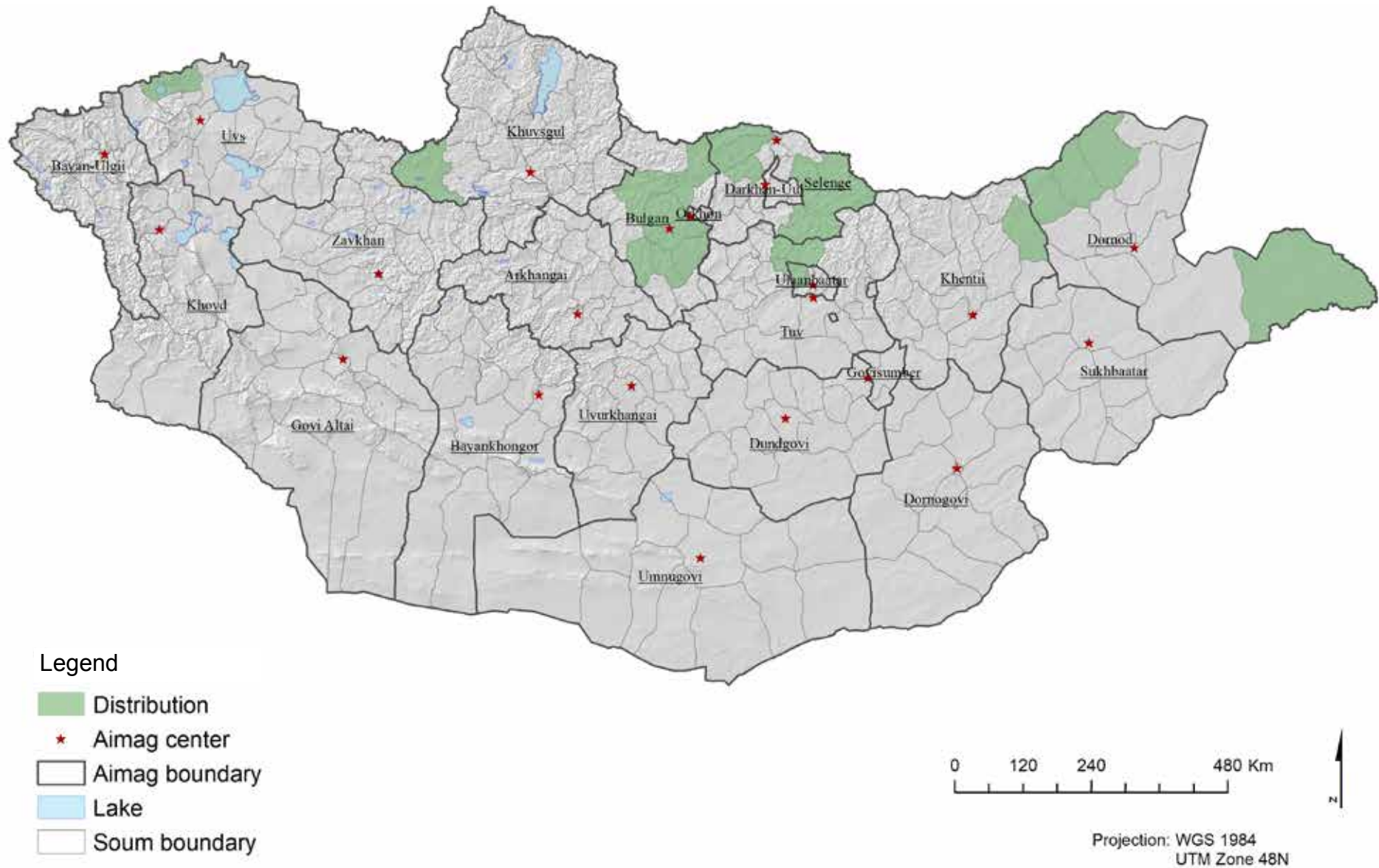
3. FORBS-GRASS-CAREX WITH DASIPHORA FRUTICOSA MEADOW STEPPE RANGELAND IN LOAMY FAN ESG, FOREST STEPPE



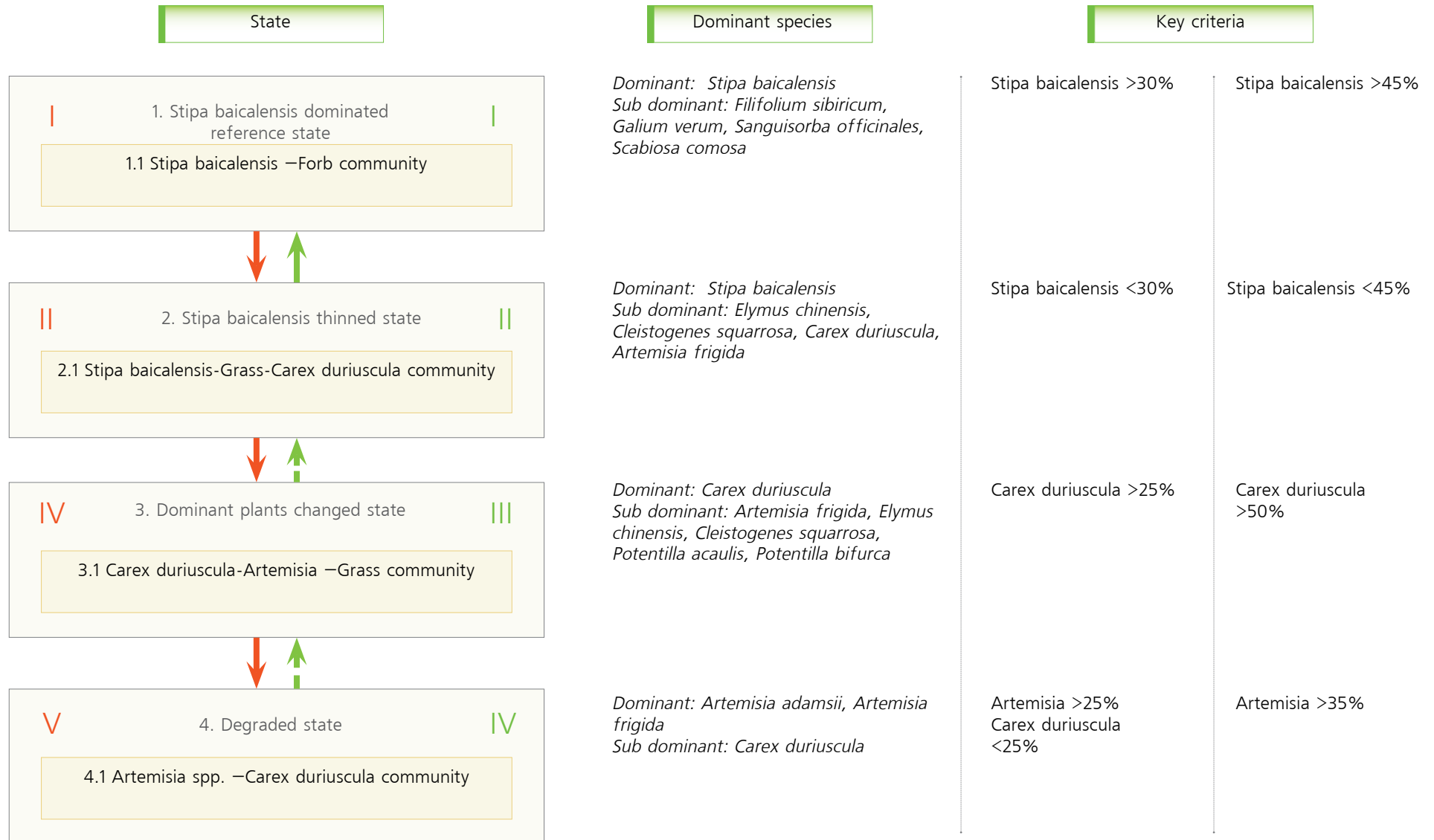
3. FORBS-GRASS-CAREX WITH DASIPHORA FRUTICOSA MEADOW STEPPE RANGELAND IN LOAMY FAN ESG, FOREST STEPPE



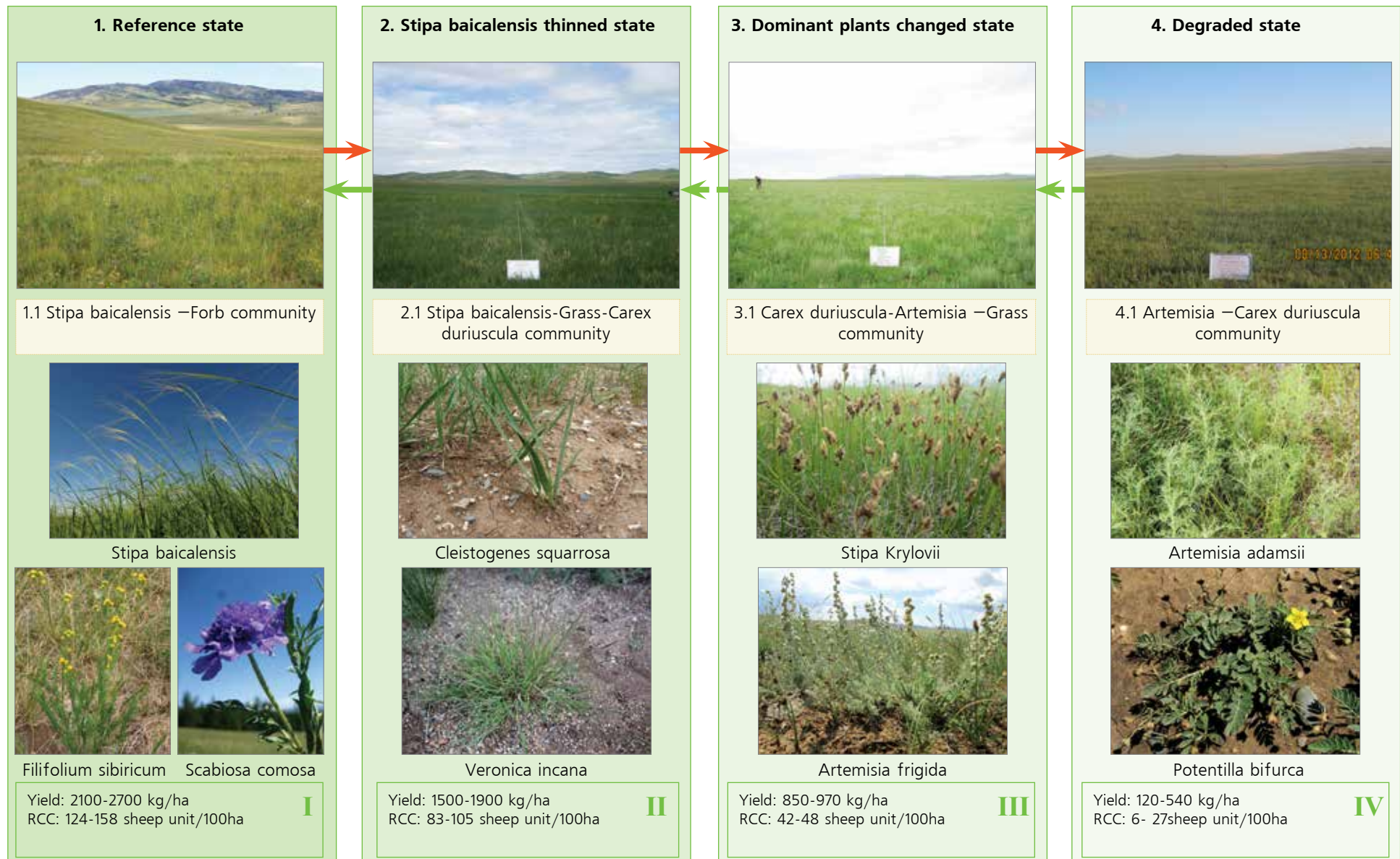
3. DISTRIBUTION OF FORBS-GRASS-CAREX WITH DASIPHORA FRUTICOSA MEADOW STEPPE RANGELAND IN LOAMY FAN ESG, FOREST STEPPE



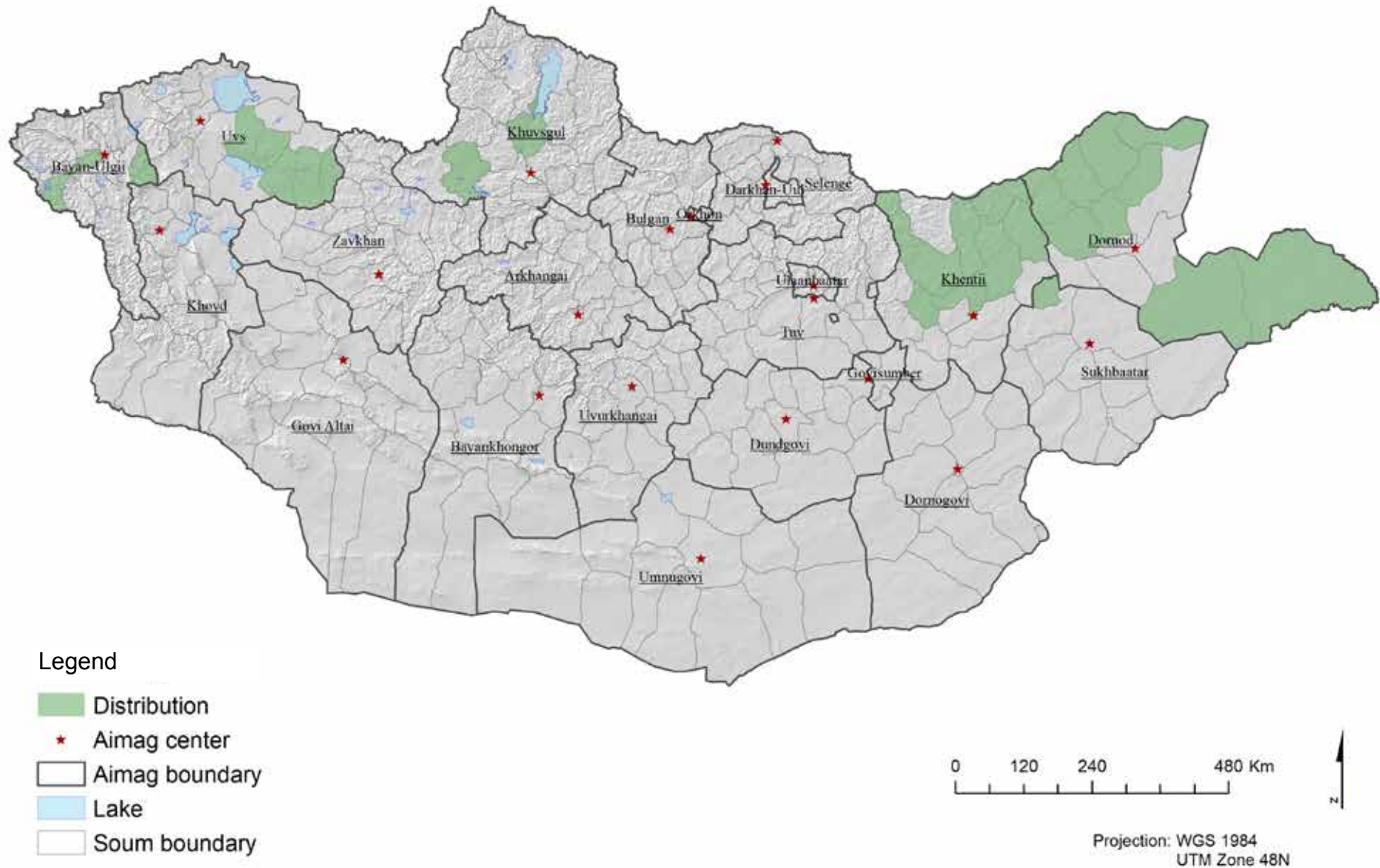
4. STIPA BAICALENSIS-FORBES MEADOW STEPPE RANGELAND IN MOUNTAIN VALLEY ESG, FOREST STEPPE



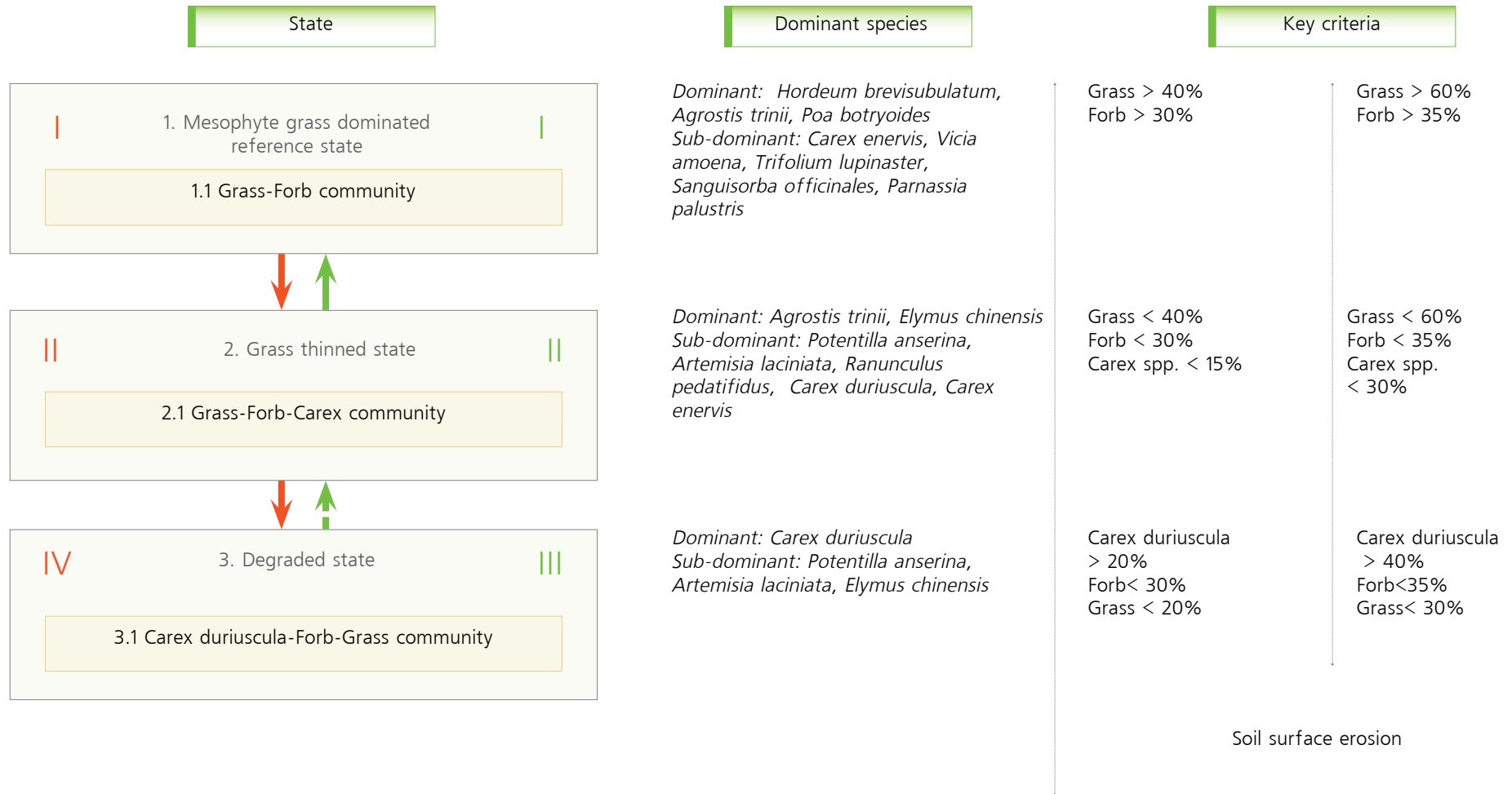
4. STIPA BAICALENSIS-FORBS MEADOW STEPPE RANGELAND IN MOUNTAIN VALLEY ESG, FOREST STEPPE



4. DISTRIBUTION OF STIPA BAICALENSIS-FORBS MEADOW STEPPE RANGELAND IN MOUNTAIN VALLEY ESG, FOREST STEPPE



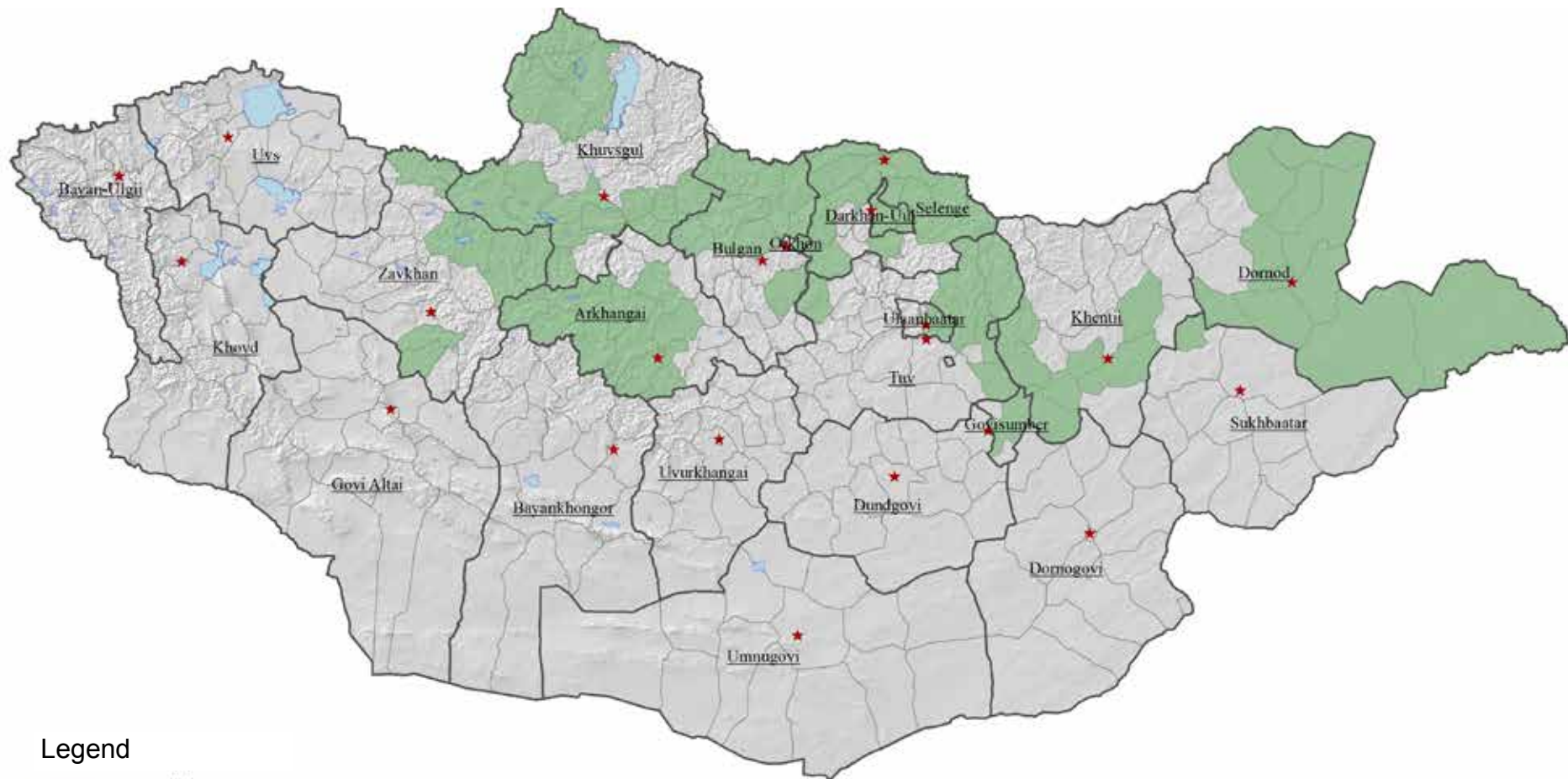
5. GRASS-FORBS RIPARIAN RANGELAND IN HIGH WATER TABLE ESG, FOREST STEPPE



5. GRASS-FORBS RIPARIAN RANGELAND IN HIGH WATER TABLE ESG, FOREST STEPPE



5. DISTRIBUTION OF GRASS-FORBS RIPARIAN RANGELAND IN HIGH WATER TABLE ESG, FOREST STEPPE



Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km



Projection: WGS 1984
UTM Zone 48N

STEPPE ZONE

GRAVELLY HILLS AND FAN

SANDY LOAM ALLUVIAL FAN AND PLAIN

DEEP SANDY ALLUVIAL PLAIN

SANDY LOAM PLAIN

HIGH WATER TABLE

6. *Stipa Krylovii*-Small bunch grass-Forbs dry steppe rangeland in Gravelly hills and fan ESG, Steppe

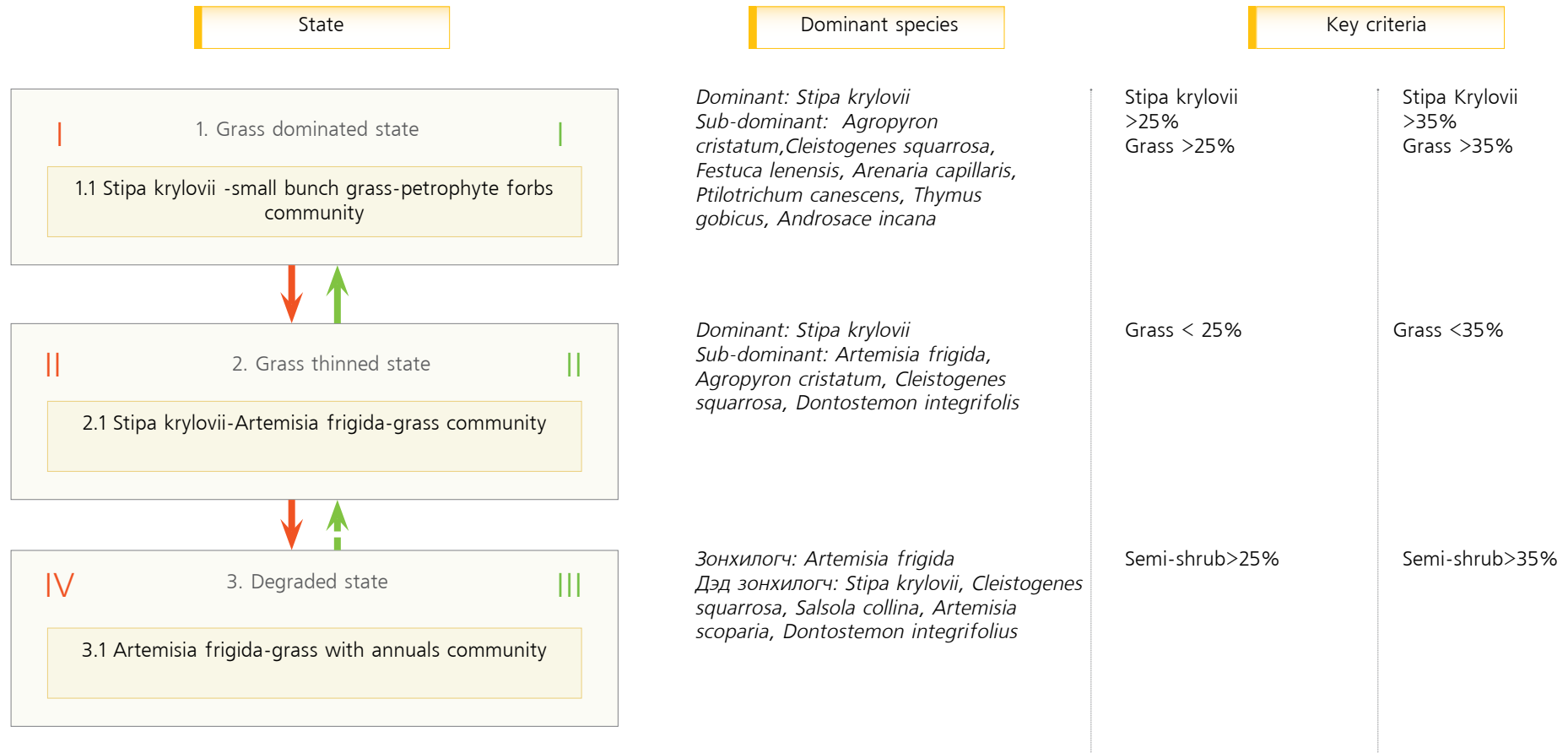
7. *Stipa krylovii*-grass dry steppe rangeland in Sandy loam alluvial fan and plain ESG, Steppe

8. *Stipa krylovii*-grass with *Caragana* steppe rangeland in Deep sandy alluvial plain, Steppe

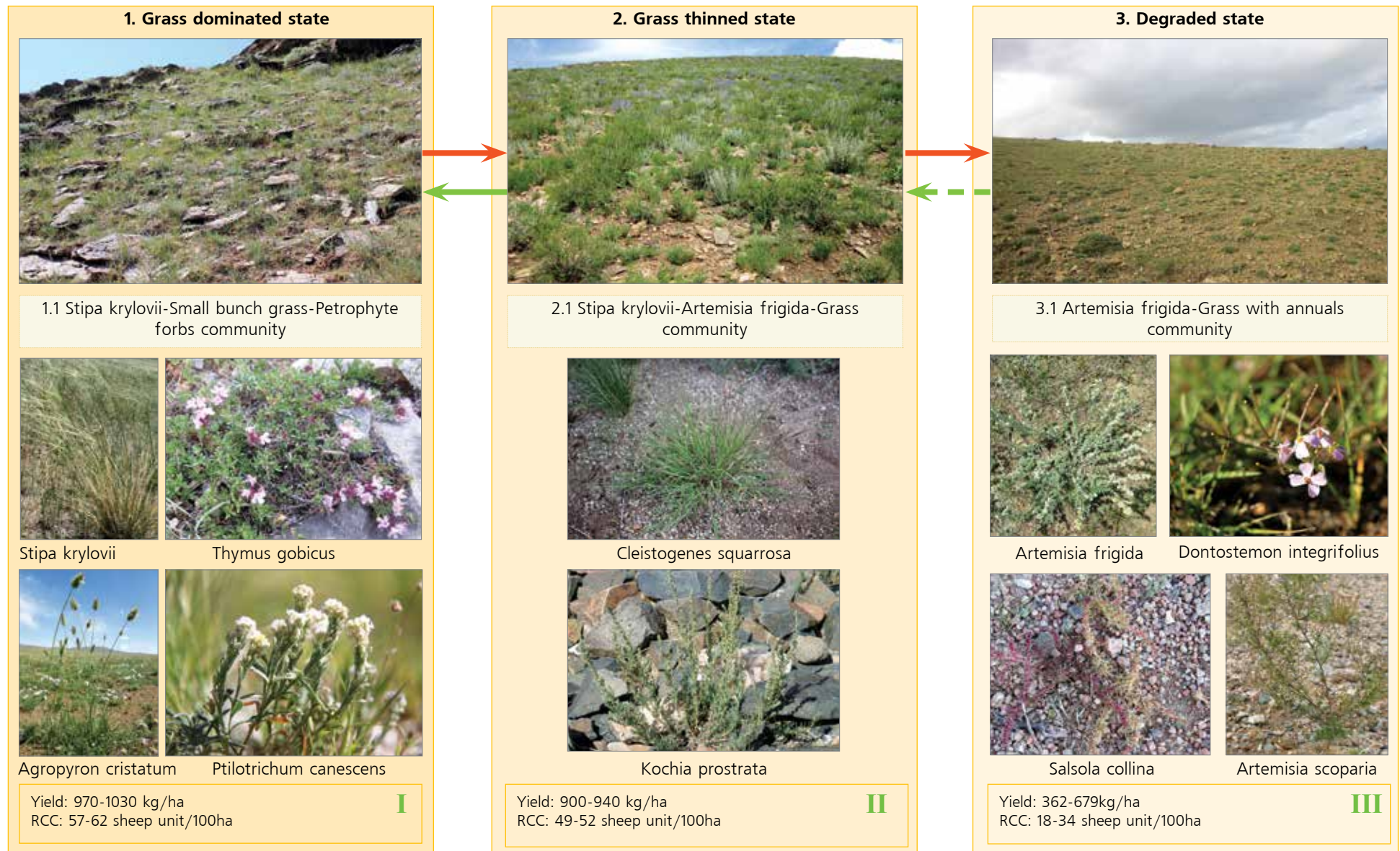
9. *Stipa grandis*-*Elymus chinensis*-Forbs dry steppe rangeland in Sandy loam ESG, Steppe

10. *Achnatherum splendens* rangeland in High water table ESG, Steppe

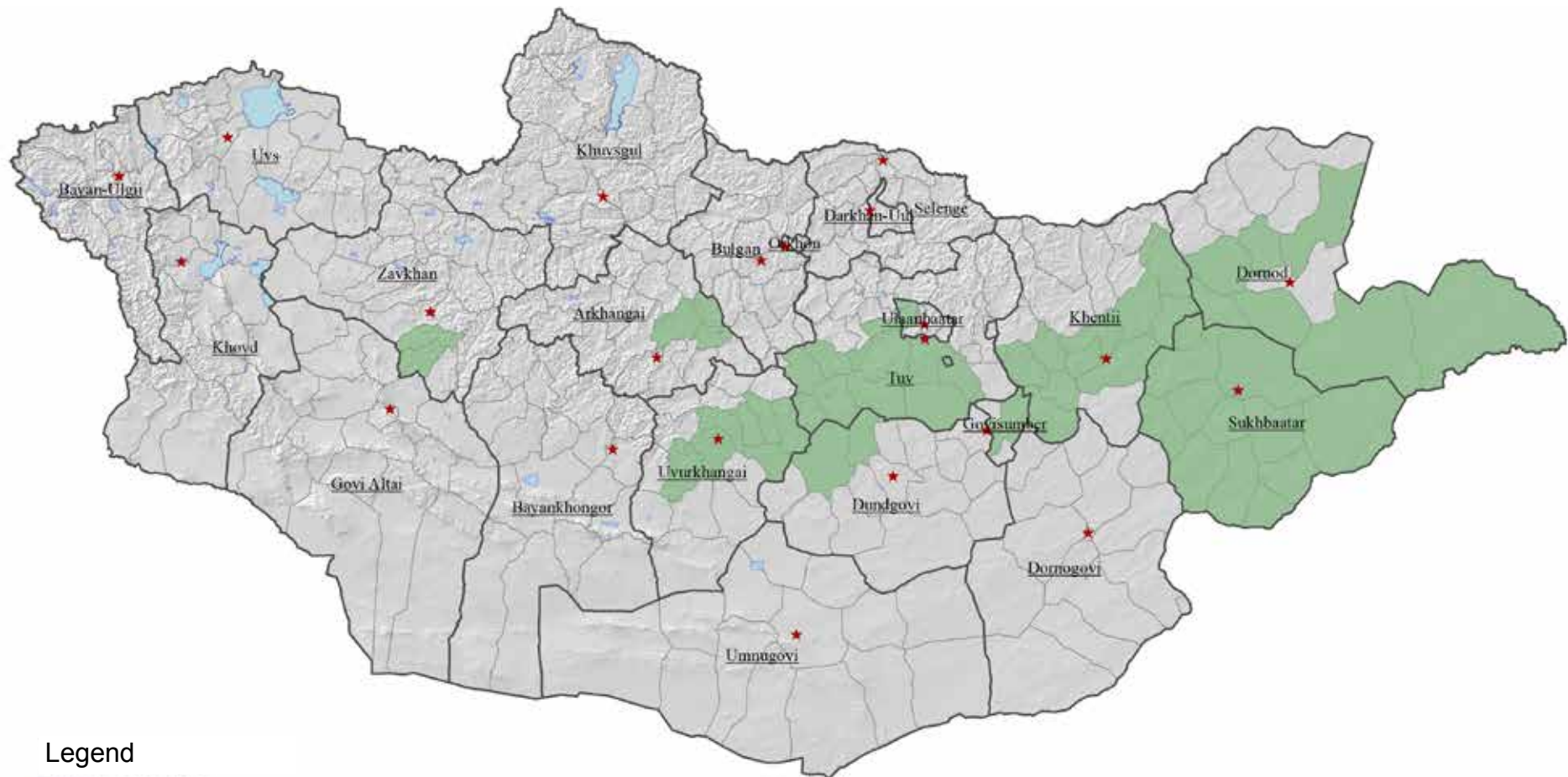
6. STIPA KRYLOVII-SMALL BUNCH GRASS-FORBS DRY STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, STEPPE



6. STIPA KRYLOVII-SMALL BUNCH GRASS-FORBS DRY STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, STEPPE



6. DISTRIBUTION OF STIPA KRYLOVII-SMALL BUNCH GRASS-FORBS DRY STEPPE RANGELAND IN GRAVELLY HILLS AND FAN ESG, STEPPE



Legend

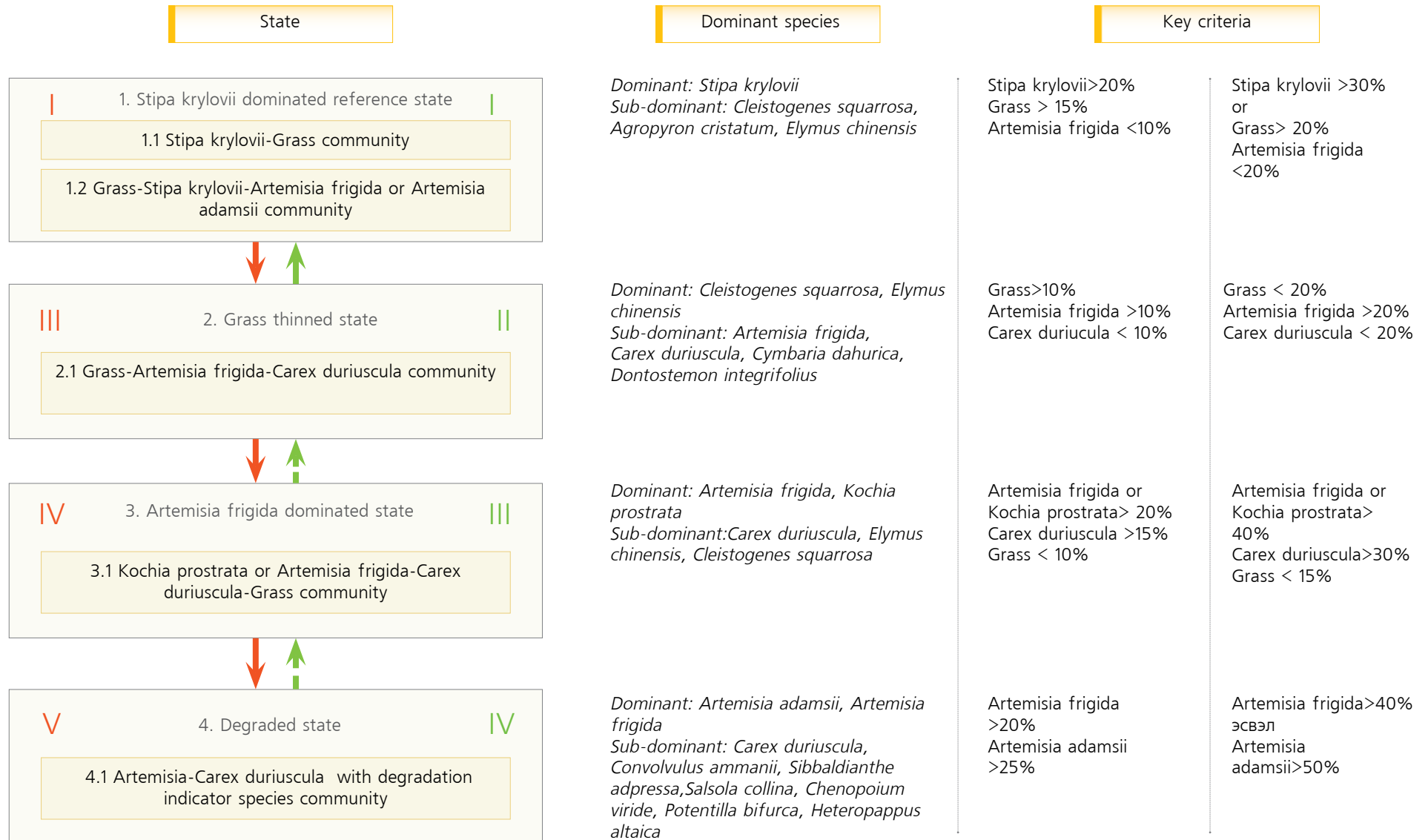
- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km

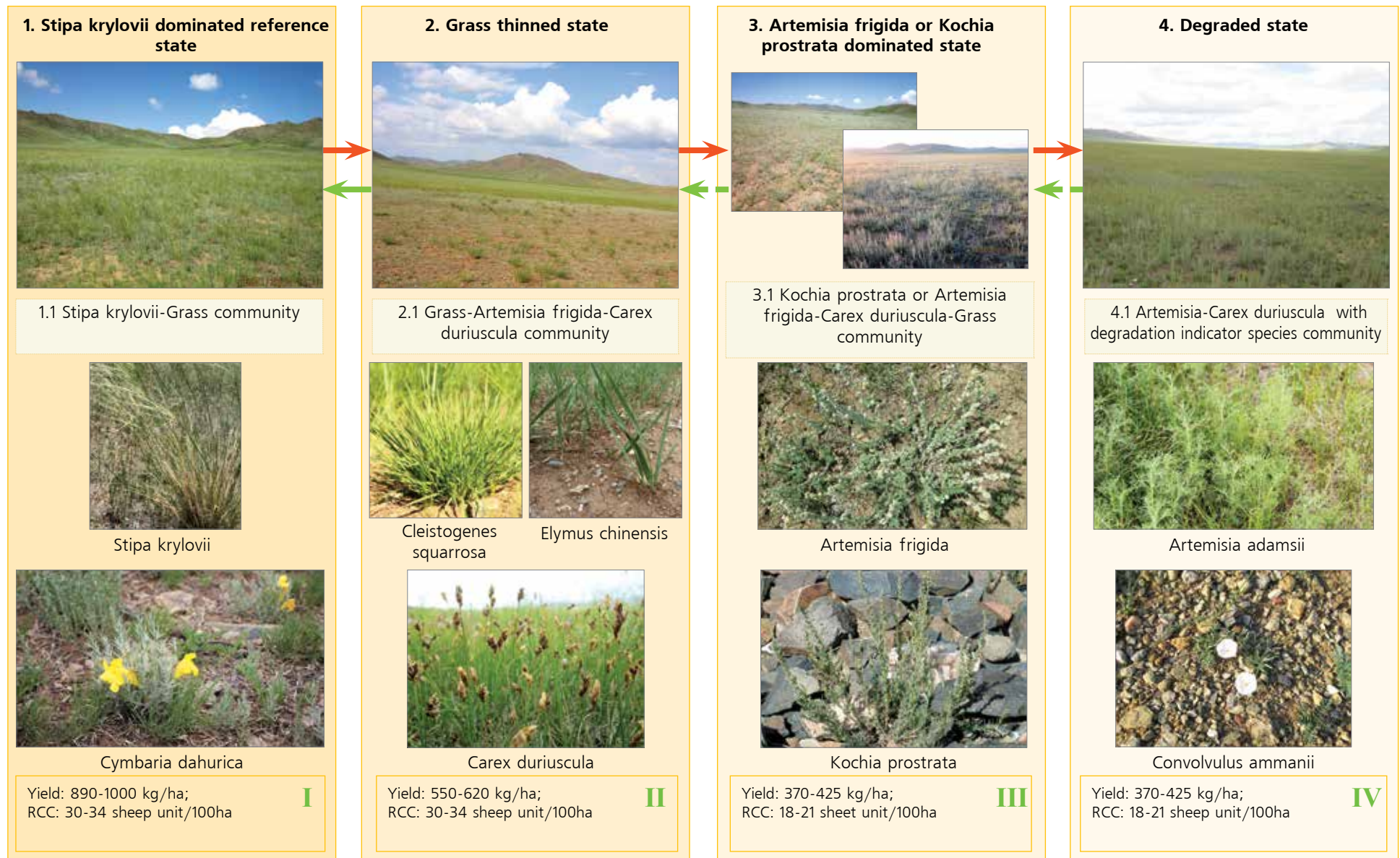


Projection: WGS 1984
UTM Zone 48N

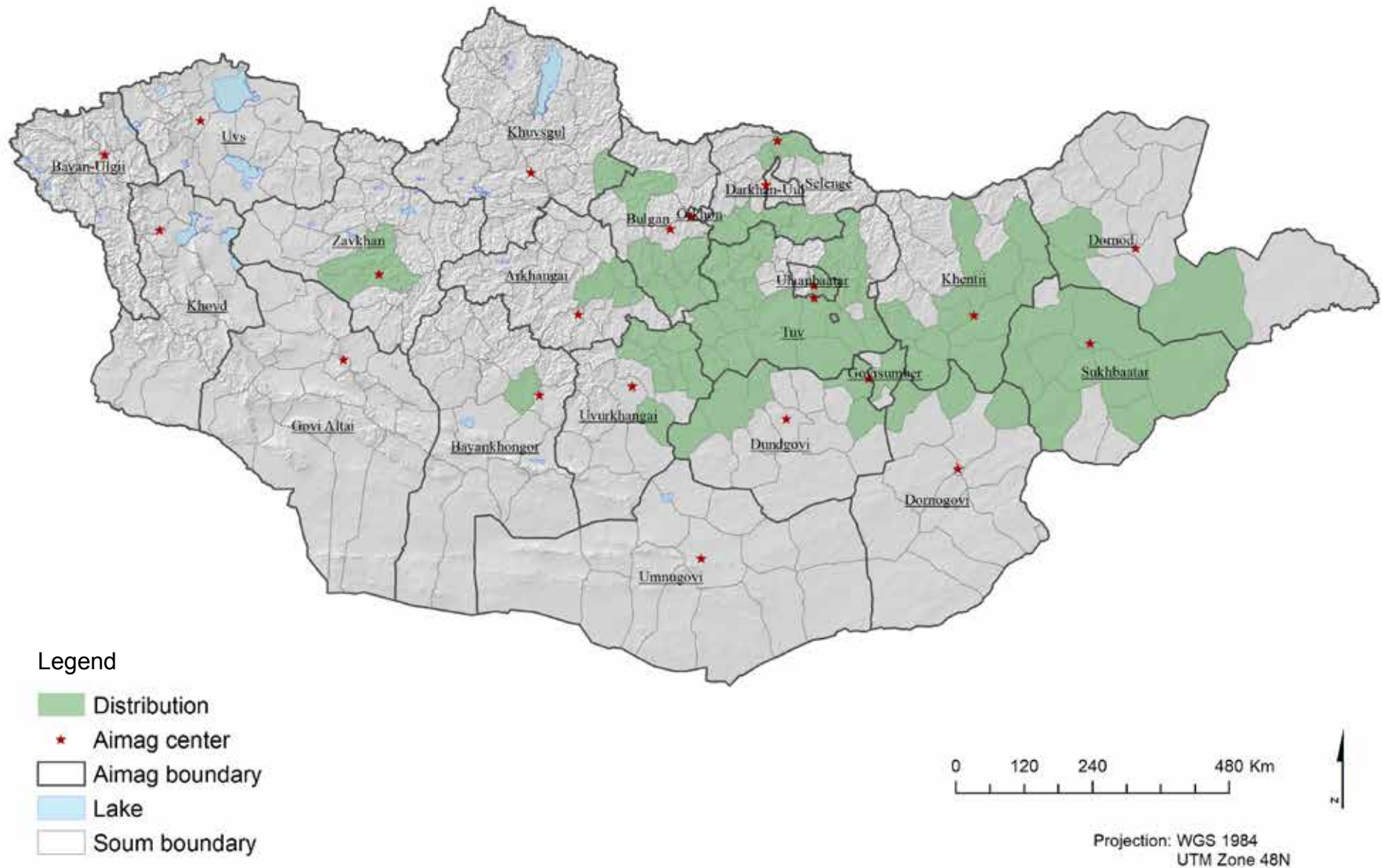
7. STIPA KRYLOVII-GRASS DRY STEPPE RANGELAND IN SANDY LOAM ALLUVIAL FAN AND PLAIN ESG, STEPPE



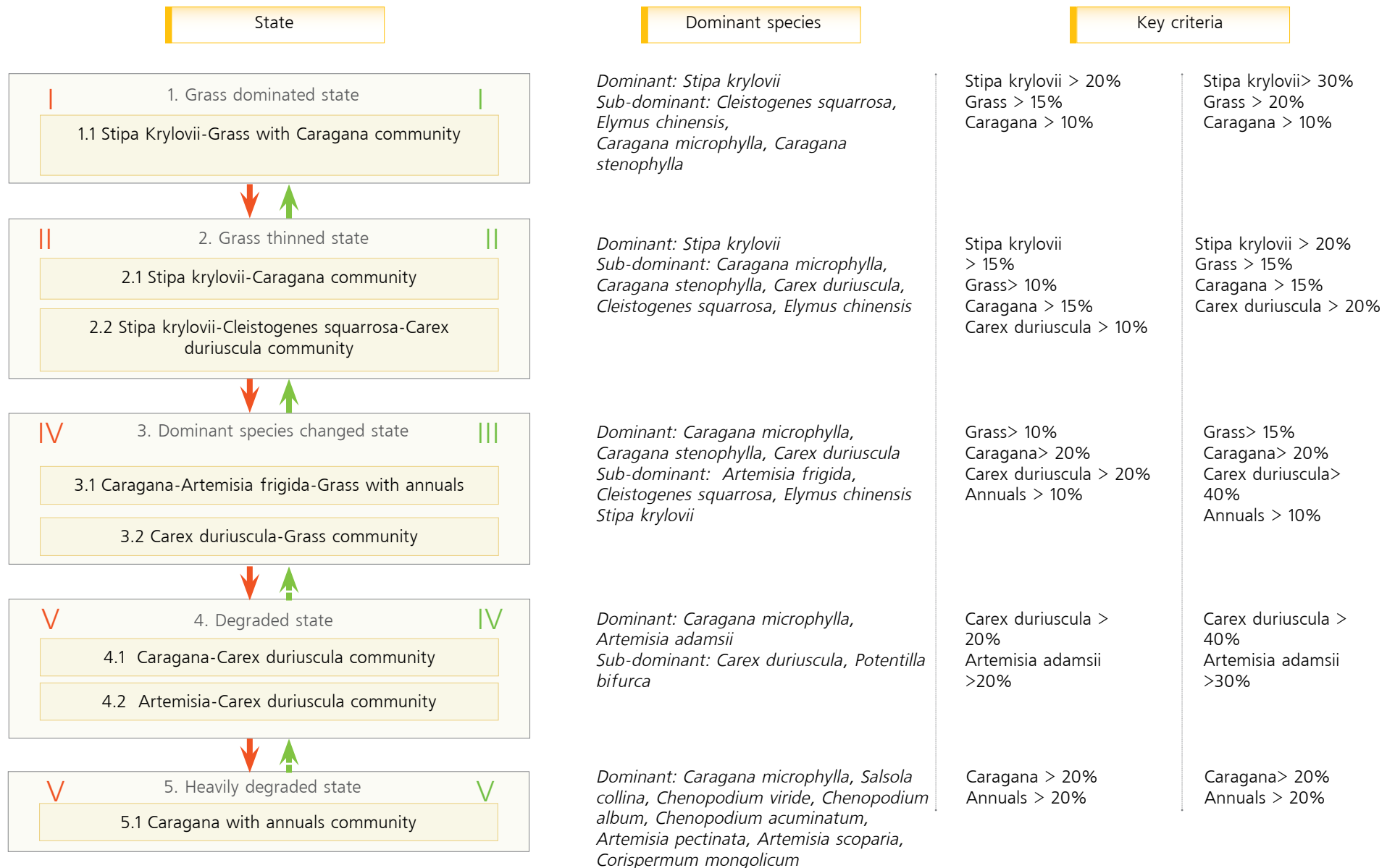
7. STIPA KRYLOVII-GRASS DRY STEPPE RANGELAND IN SANDY LOAM ALLUVIAL FAN AND PLAIN ESG, STEPPE



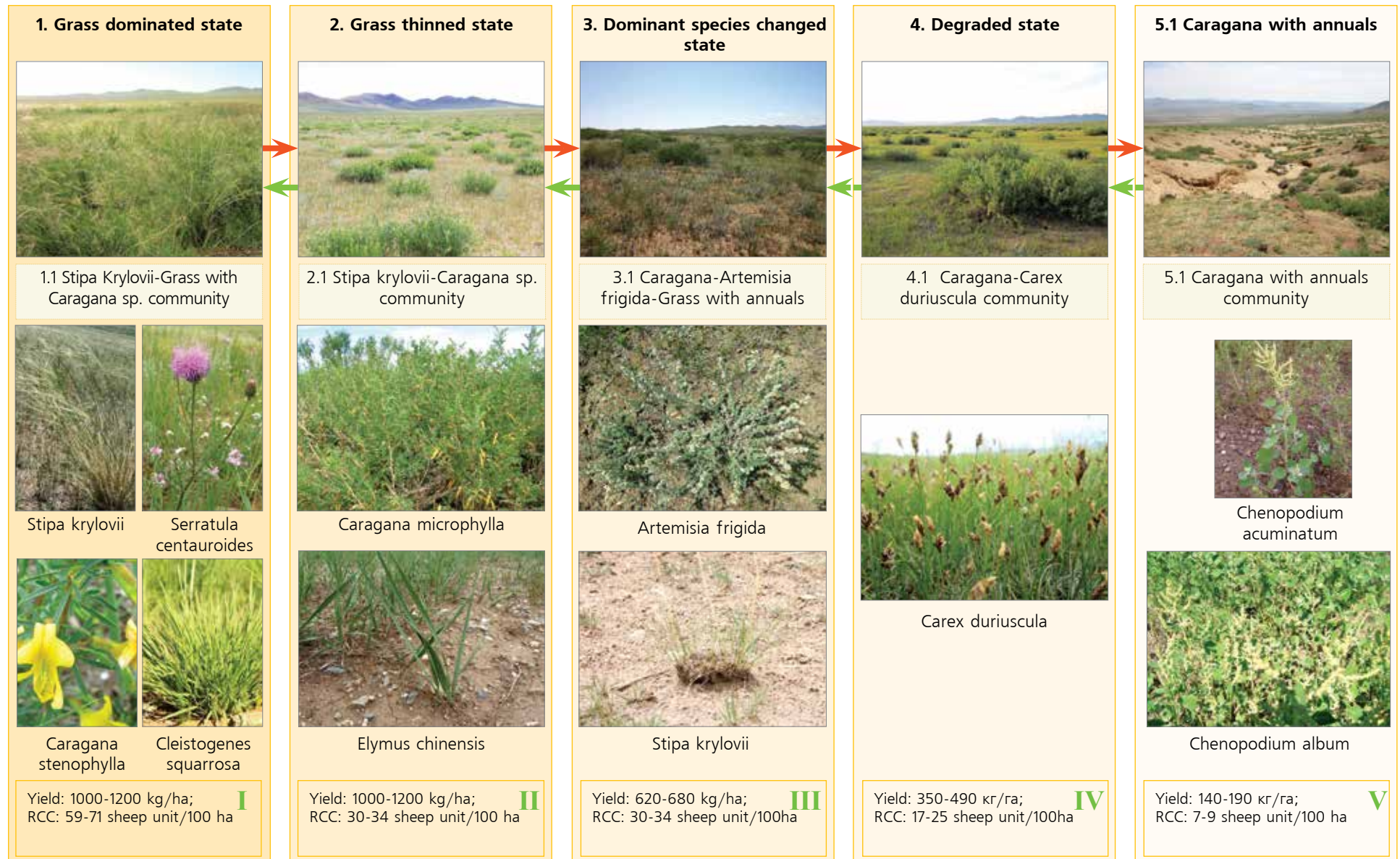
7. DISTRIBUTION OF STIPA KRYLOVII-GRASS DRY STEPPE RANGELAND IN SANDY LOAM ALLUVIAL FAN AND PLAIN ESG, STEPPE



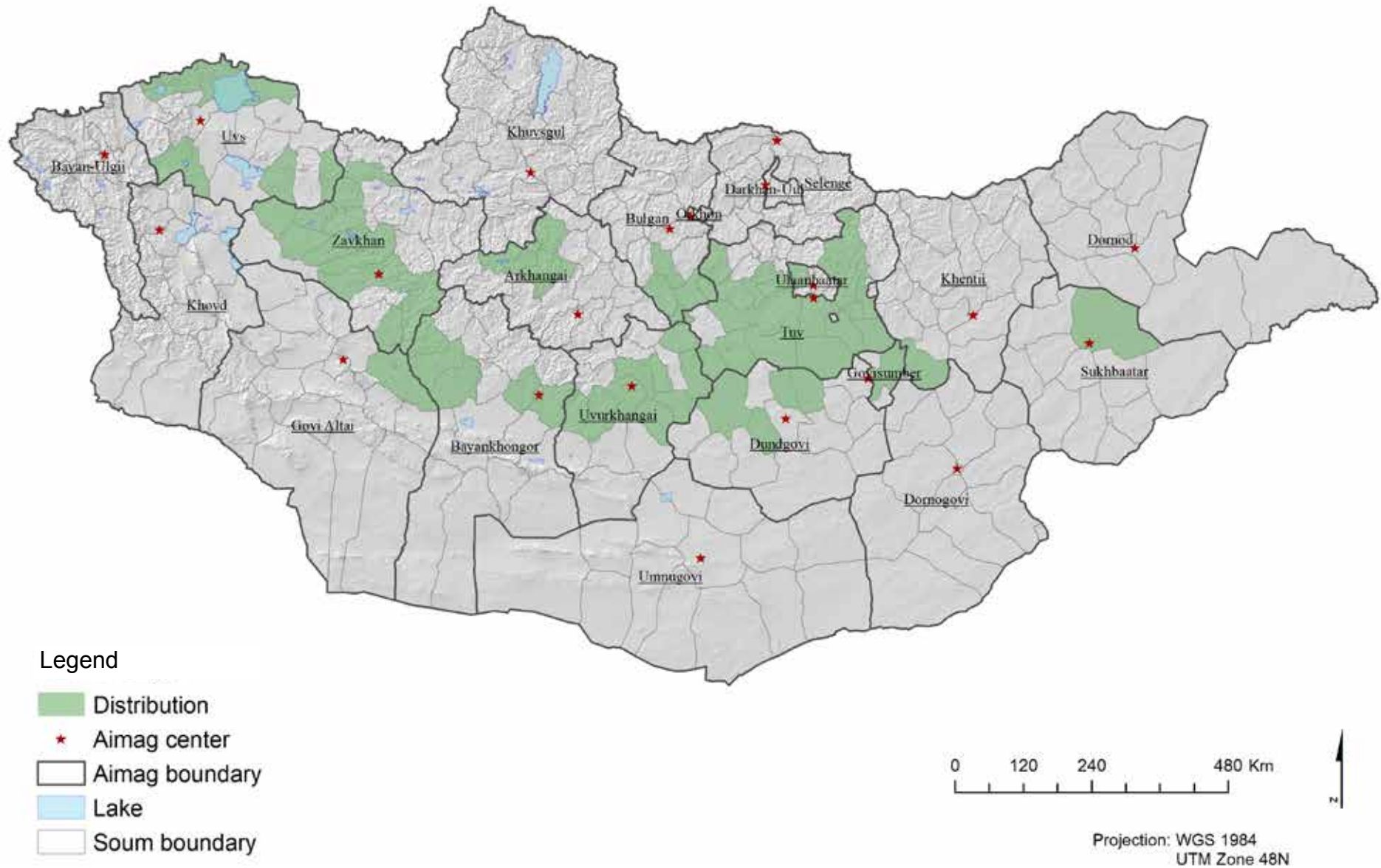
8. STIPA KRYLOVII-GRASS WITH CARAGANA STEPPE RANGELAND IN DEEP SANDY ALLUVIAL PLAIN, STEPPE



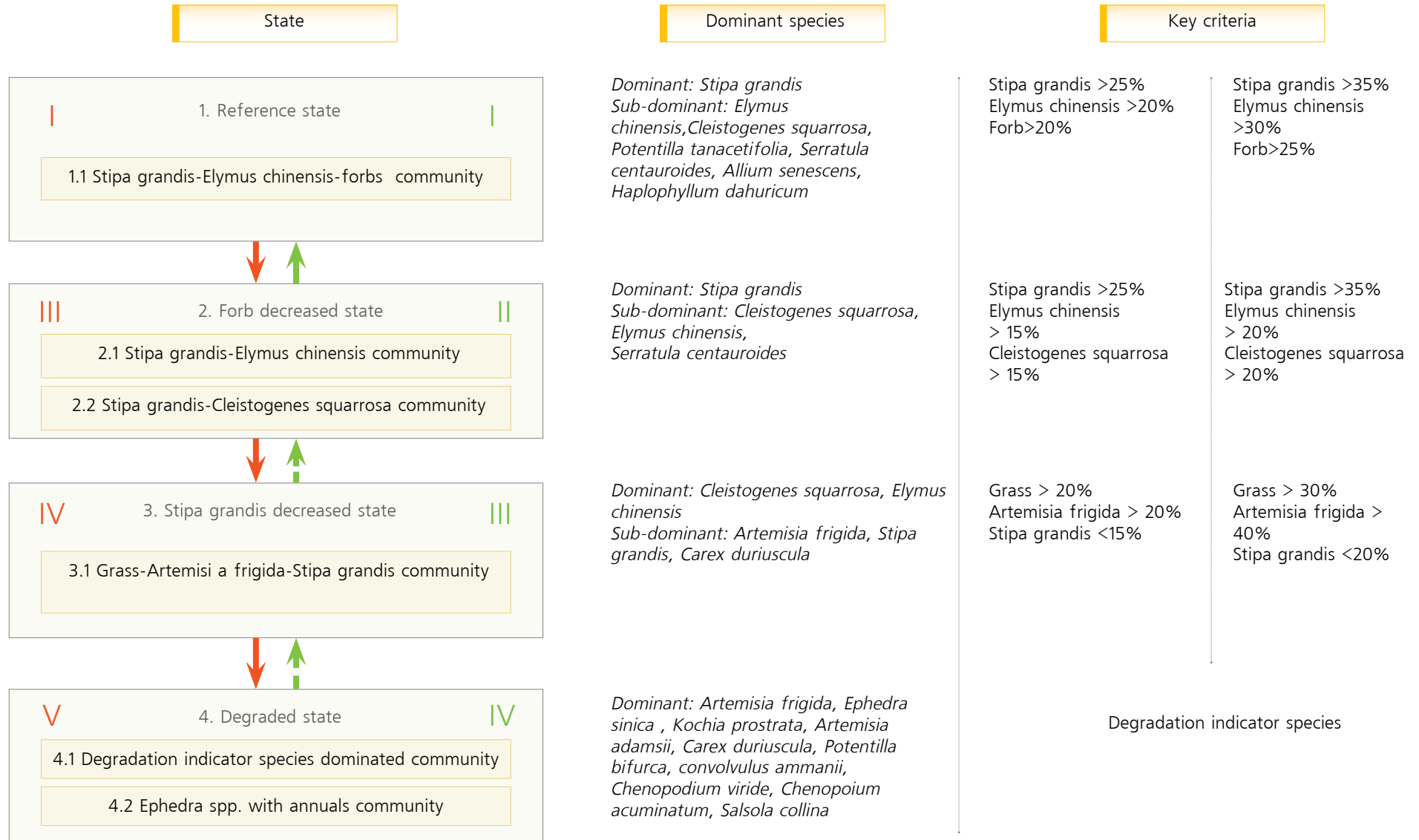
8. STIPA KRYLOVII–GRASS WITH CARAGANA STEPPE RANGELAND IN DEEP SANDY ALLUVIAL PLAIN, STEPPE



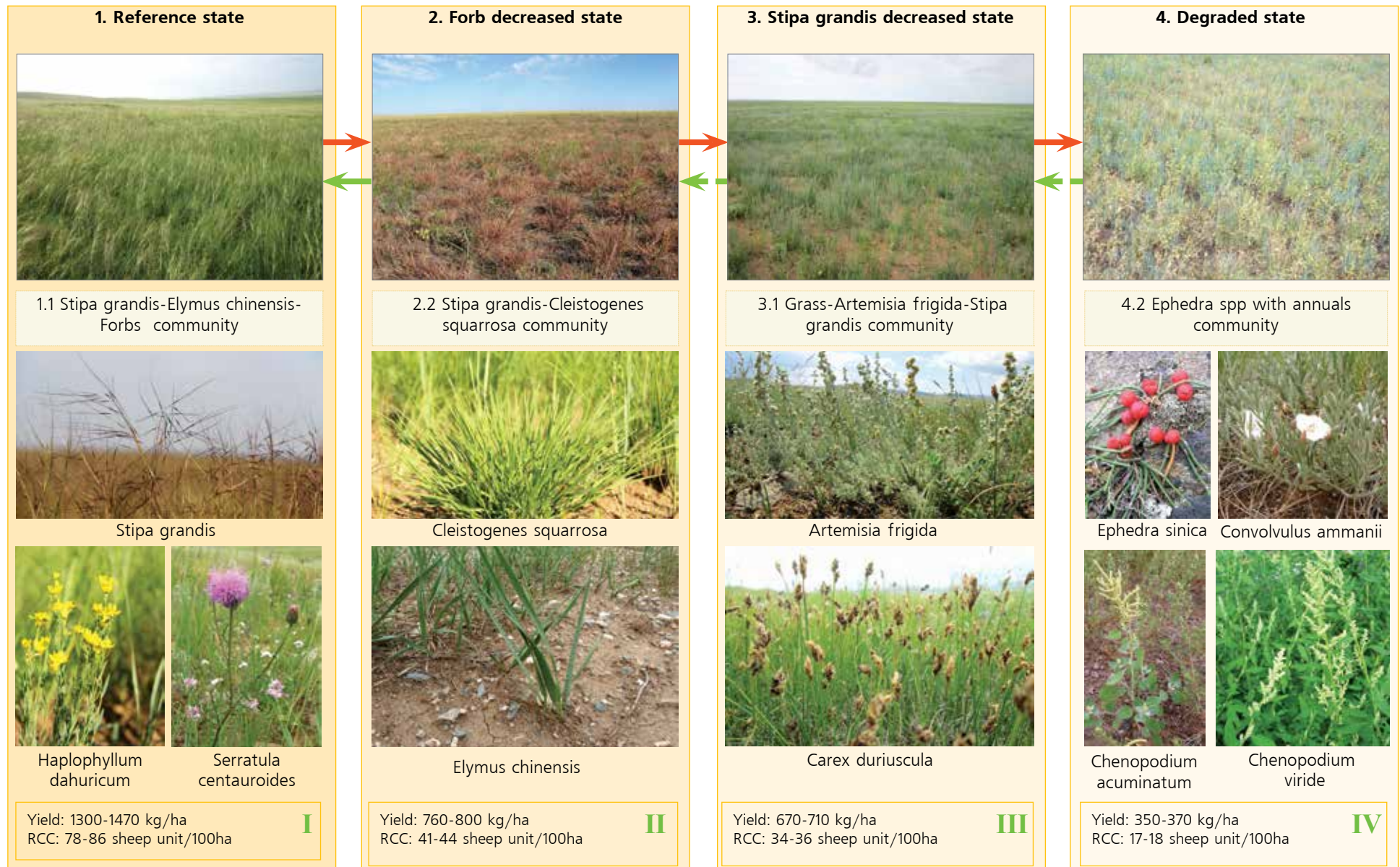
8. DISTRIBUTION OF STIPA KRYLOVII-GRASS WITH CARAGANA STEPPE RANGELAND IN DEEP SANDY ALLUVIAL PLAIN, STEPPE



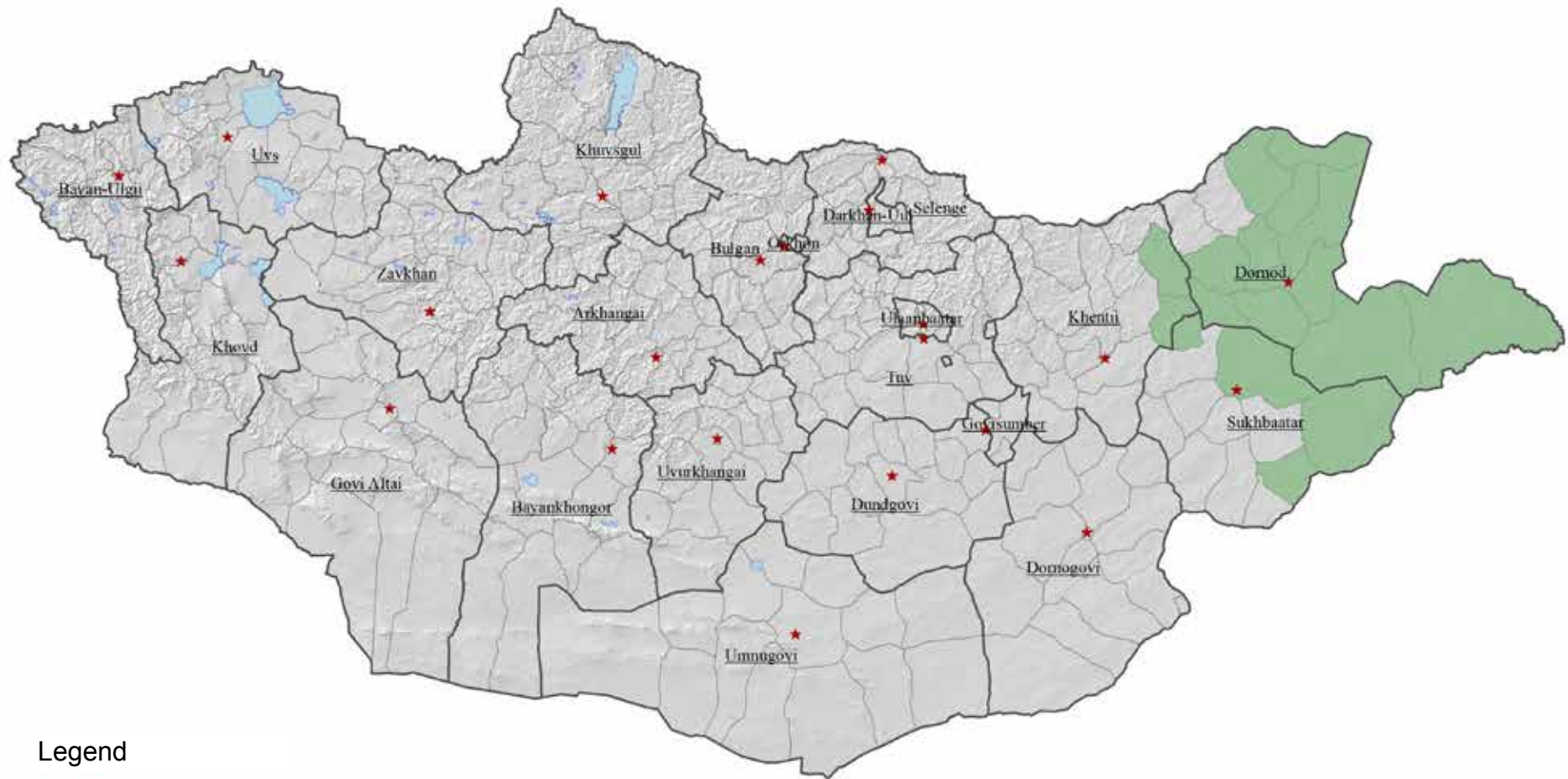
9. STIPA GRANDIS-ELYMUS CHINENSIS-FORBS DRY STEPPE RANGELAND IN SANDY LOAM ESG, STEPPE



9. STIPA GRANDIS-ELYMUS CHINENSIS-FORBS DRY STEPPE RANGELAND IN SANDY LOAM ESG, STEPPE

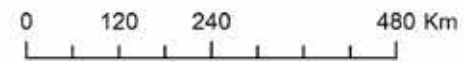


9. DISTRIBUTION OF STIPA GRANDIS-ELYMUS CHINENSIS-FORBS DRY STEPPE RANGELAND IN SANDY LOAM ESG, STEPPE



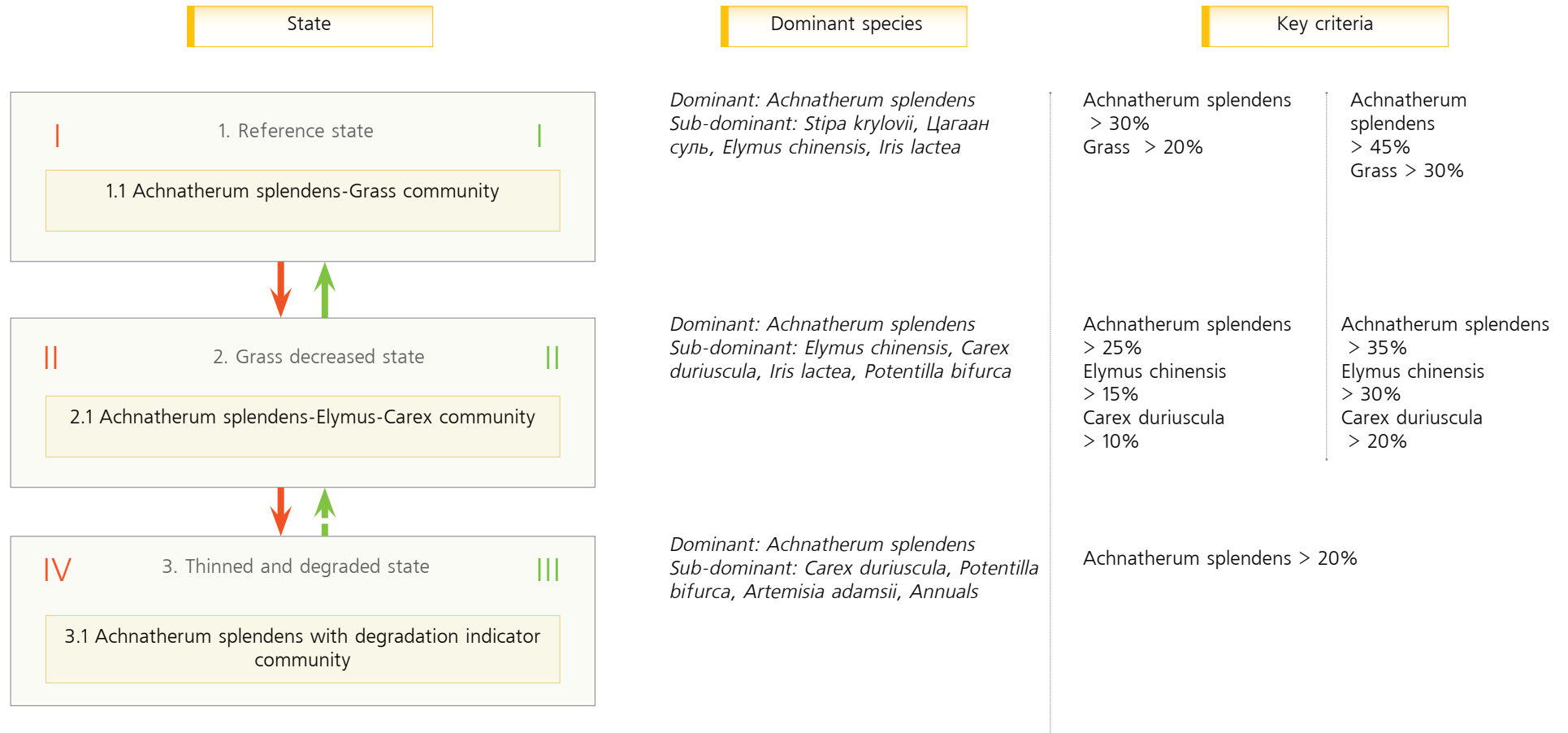
Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

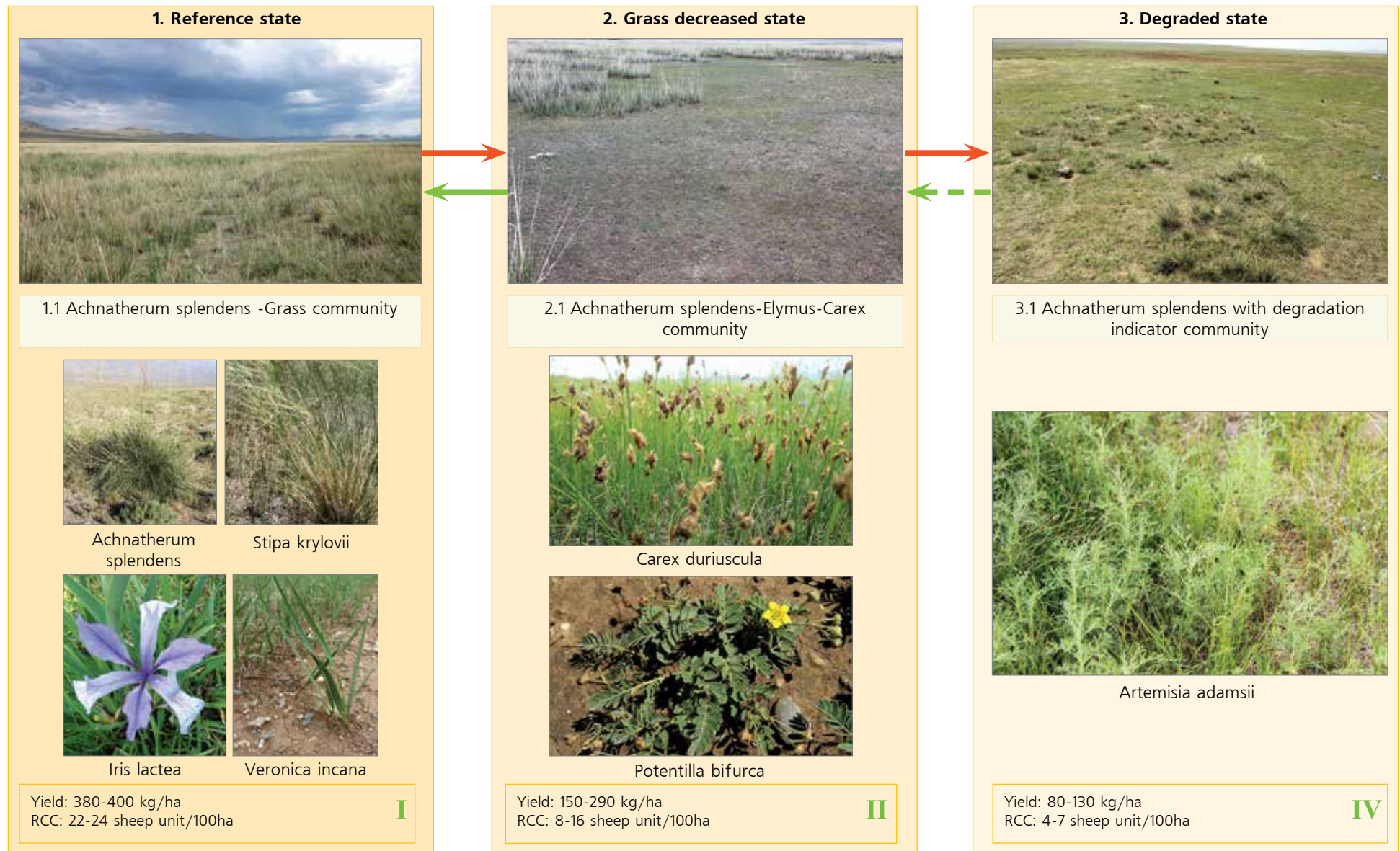


Projection: WGS 1984
UTM Zone 48N

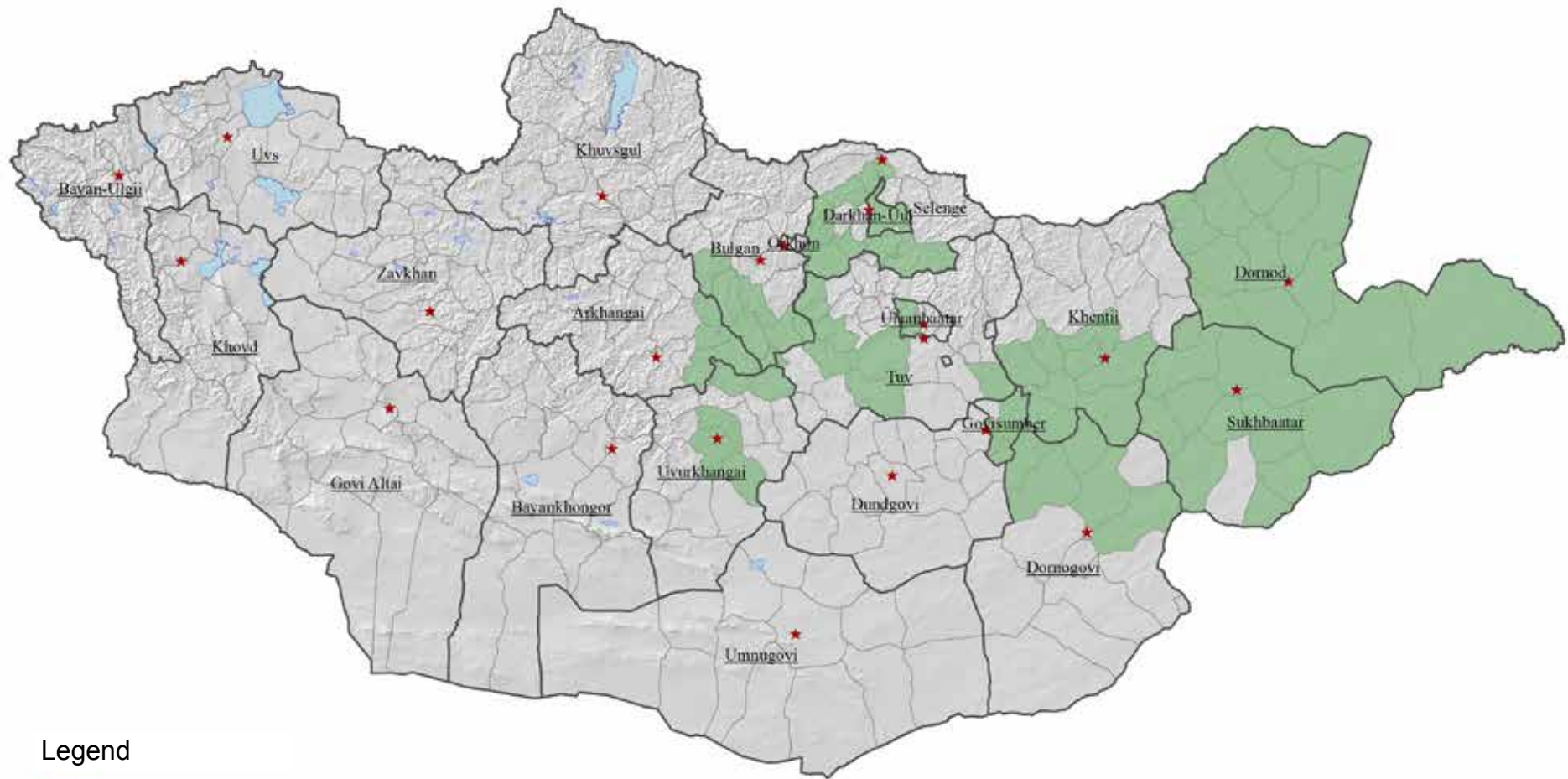
10. ACHNATHERUM SPLENDENS RANGELAND IN HIGH WATER TABLE ESG, STEPPE



10. ACHNATHERUM SPLENDENS RANGELAND IN HIGH WATER TABLE ESG, STEPPE



10. DISTRIBUTION OF ACHNATHERUM SPLENDENS RANGELAND IN HIGH WATER TABLE ESG, STEPPE



Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km



Projection: WGS 1984
UTM Zone 48N

DESERT STEPPE ZONE

GRAVELLY HILLS

11. *Stipa gobica*/
glareosa-Semi-
shrub desert steppe
rangeland in Gravelly
hills ESG, Desert
steppe

SANDY PLAIN

12. *Stipa gobica*/
glareosa-Grass-
Allium polyrrhizum
-Shrub desert steppe
rangeland in Sandy
plain ESG, Desert
steppe

SALINE PLAIN

13. *Stipa gobica*/
glareosa-Semi-shrub-
Allium polyrrhizum
desert steppe
rangeland in Saline
plain ESG, Desert
steppe

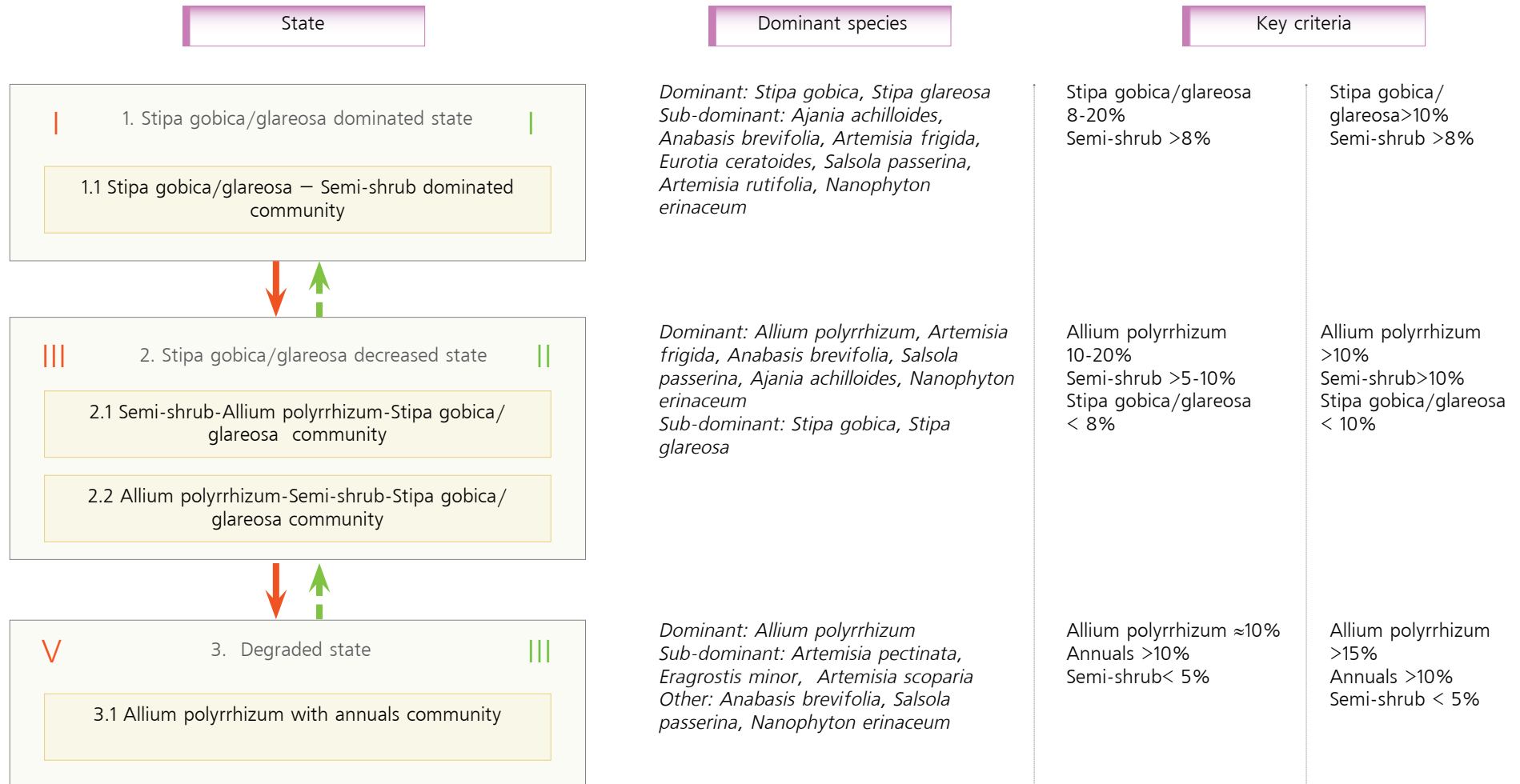
SOLANCHAK LOWLAND

14. *Achnatherum*
splendens-*Kalidium*
foliatum/*Reaumuria*
soongorica desert
steppe rangeland in
Solanchak lowland
ESG, Desert steppe

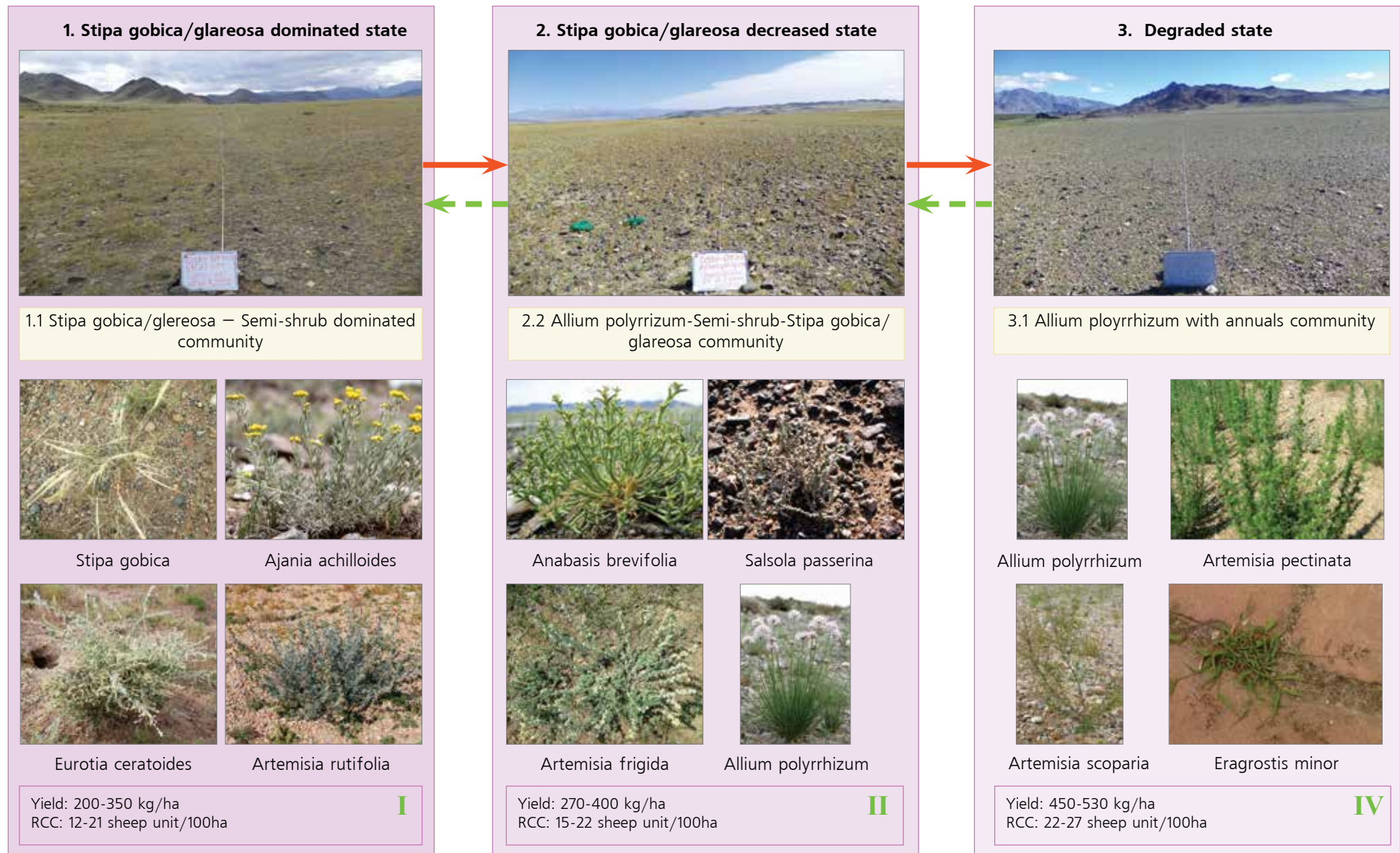
DEEP SANDY PLAIN

15. *Psammochloa*
villosa desert steppe
rangeland in Deep
sandy plain ESG,
Desert steppe

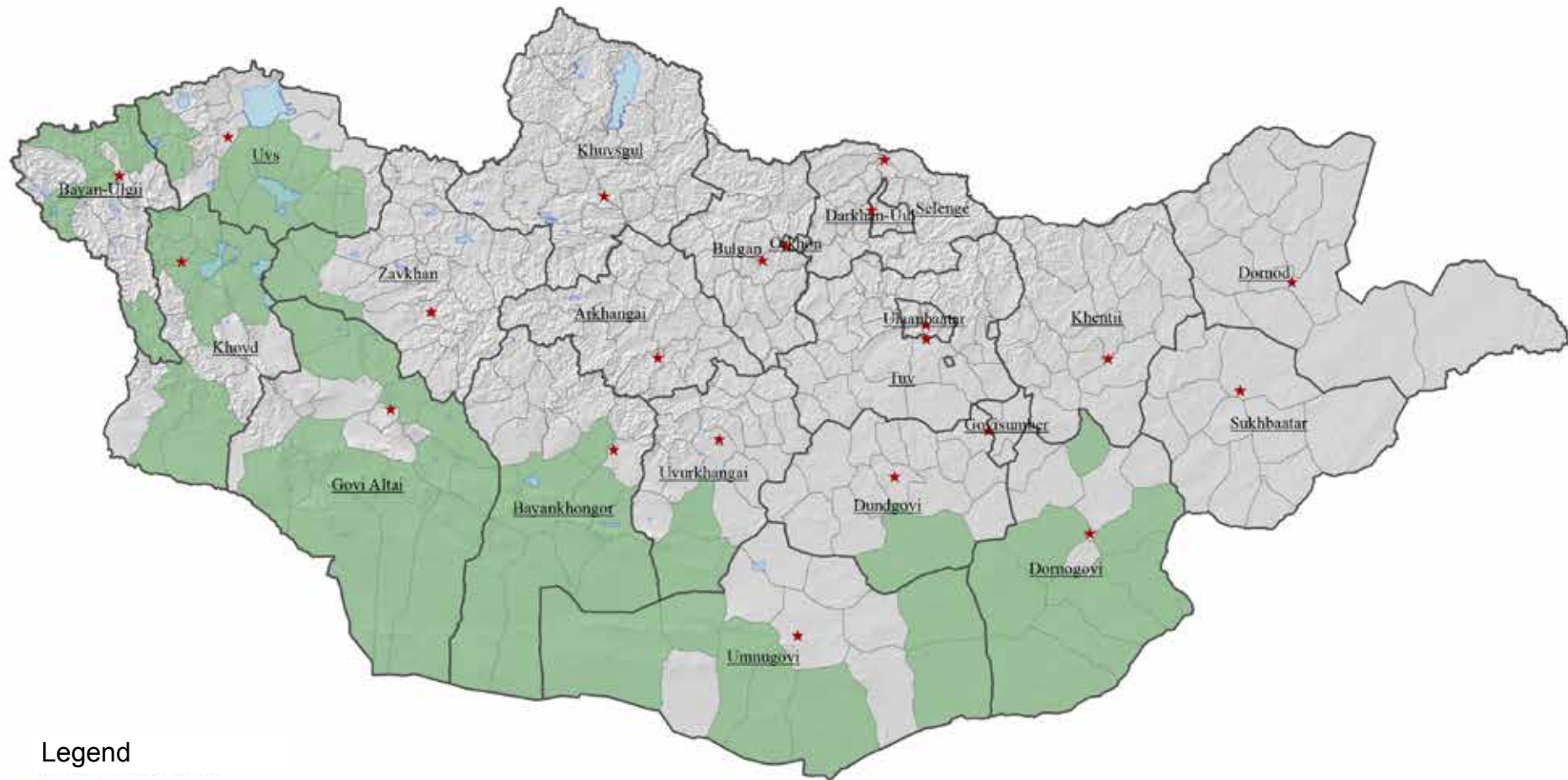
11. STIPA GOBICA/GLAREOSA-SEMI-SHRUB DESERT STEPPE RANGELAND IN GRAVELLY HILLS, DESERT STEPPE



11. STIPA GOBICA/GLAREOSA-SEMI-SHRUB DESERT STEPPE RANGELAND IN GRAVELLY HILLS, DESERT STEPPE

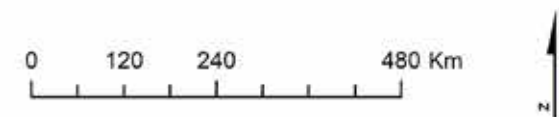


11. DISTRIBUTION OF STIPA GOBICA/GLAREOSA-SEMI-SHRUB DESERT STEPPE RANGELAND IN GRAVELLY HILLS, DESERT STEPPE



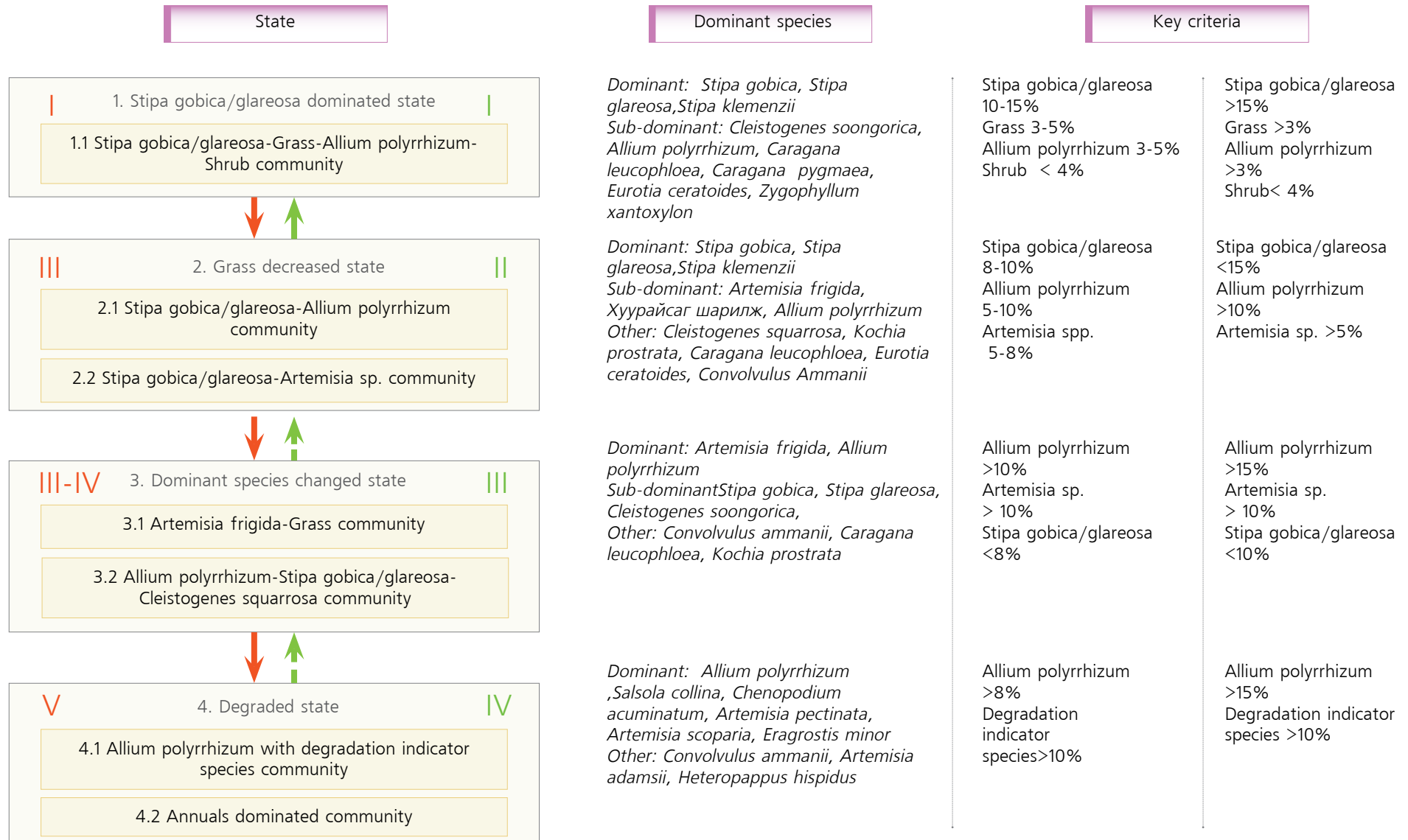
Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

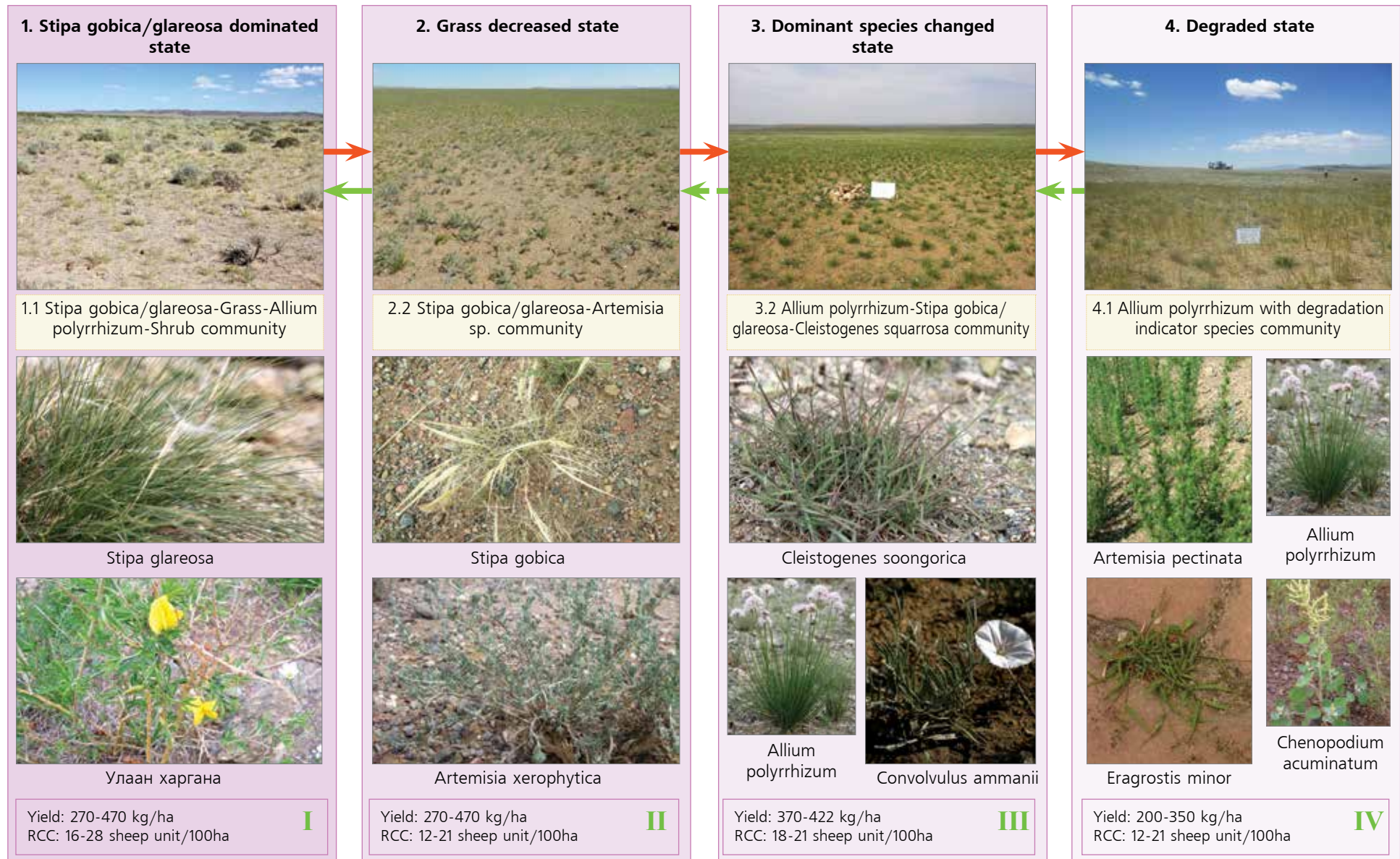


Projection: WGS 1984
UTM Zone 48N

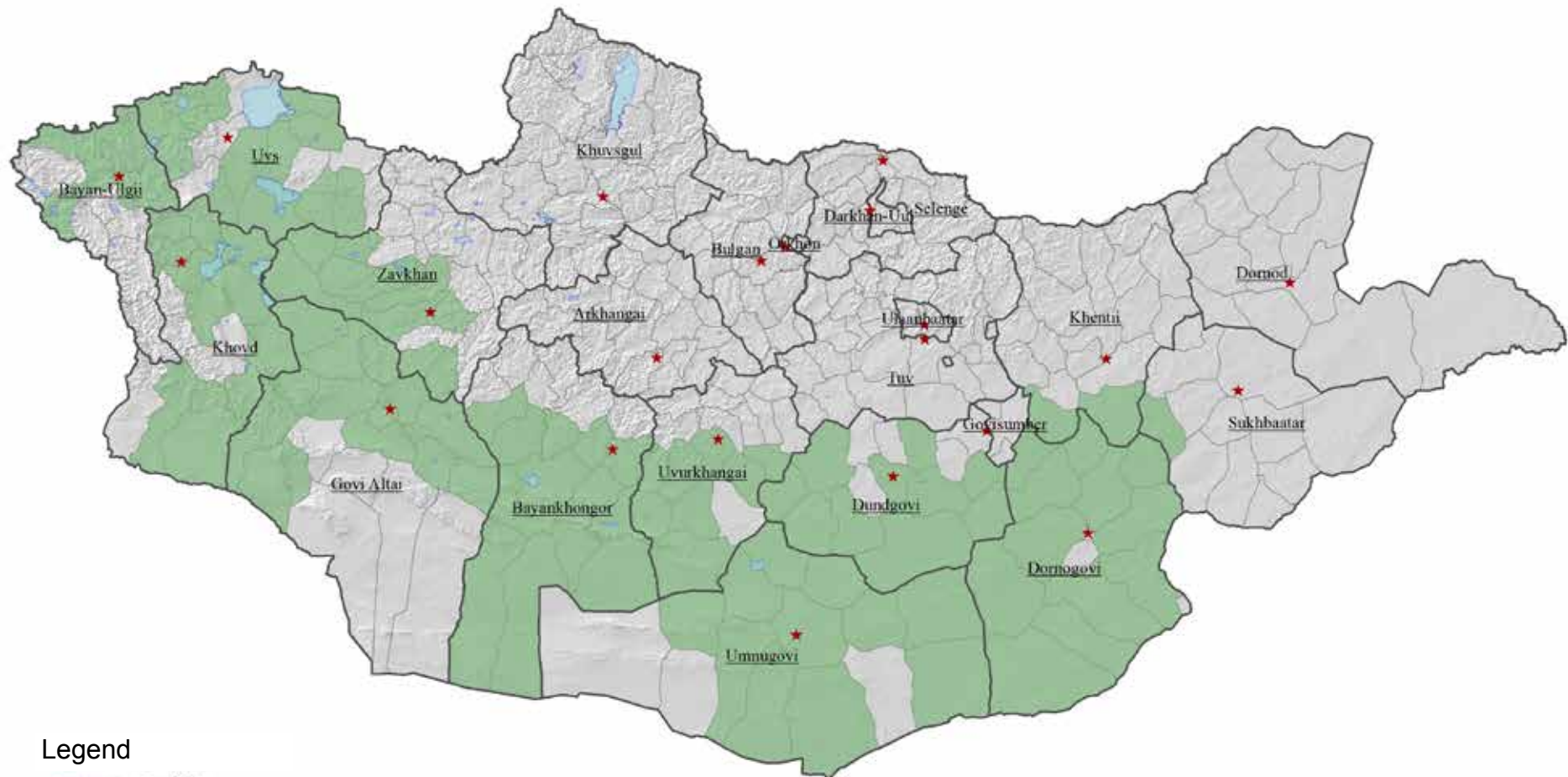
12. STIPA GOBICA/GLAREOSA-GRASS-ALLIUM POLYRRHIZUM-SHRUB DESERT STEPPE RANGELAND IN SANDY PLAIN, DESERT STEPPE



12. STIPA GOBICA/GLAREOSA-GRASS-ALLIUM POLYRRHIZUM-SHRUB DESERT STEPPE RANGELAND IN SANDY PLAIN, DESERT STEPPE



12. DISTRIBUTION OF STIPA GOBICA/GLAREOSA-GRASS-ALLIUM POLYRRHIZUM-SHRUB DESERT STEPPE RANGELAND IN SANDY PLAIN, DESERT STEPPE



Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km

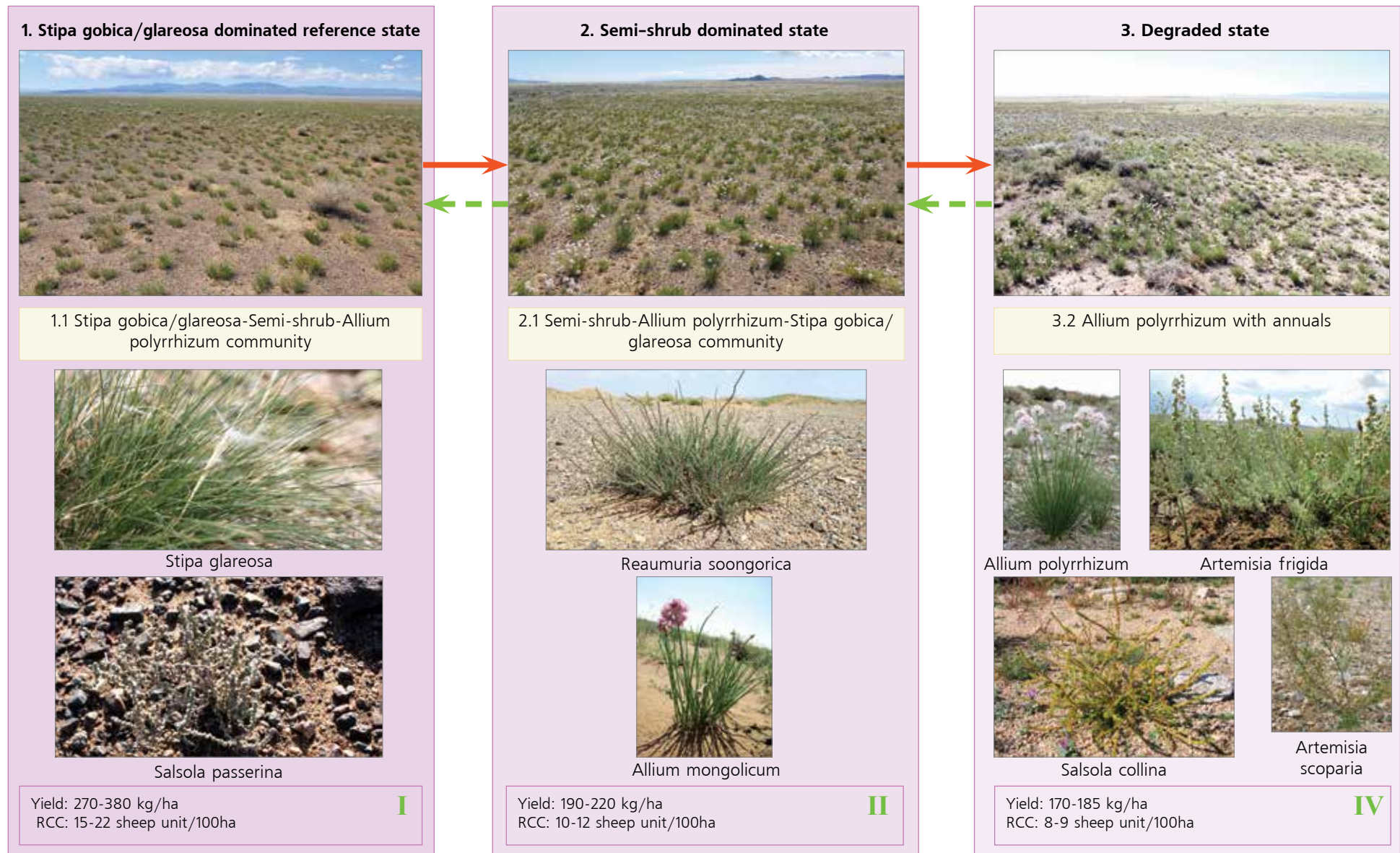


Projection: WGS 1984
UTM Zone 48N

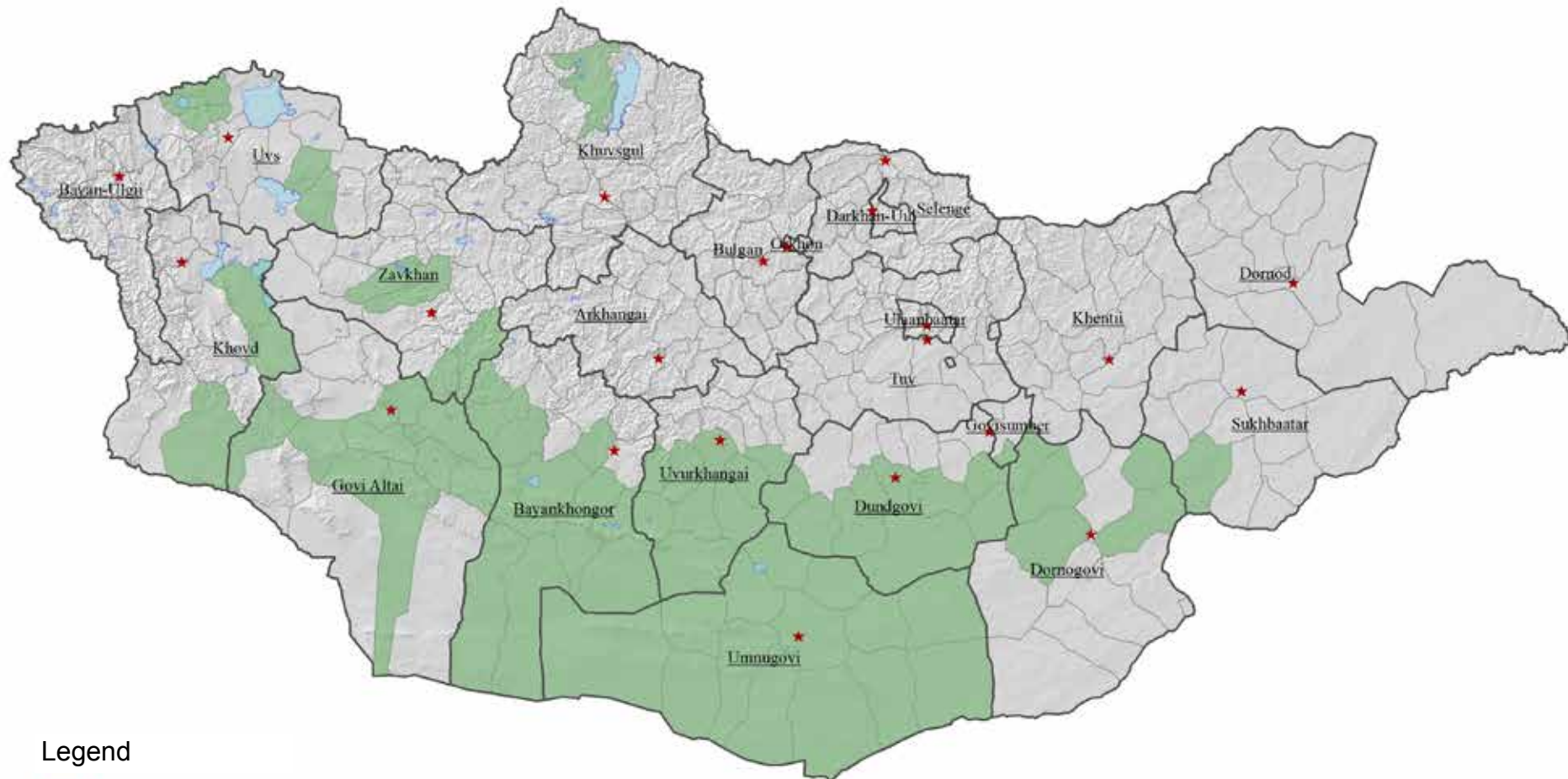
13. STIPA GOBICA/GLAREOSA-SEMI-SHRUB-ALLIUM POLYRRHIZUM DESERT STEPPE RANGELAND IN SALINE PLAIN ESG, DESERT STEPPE



13. STIPA GOBICA/GLAREOSA-SEMI-SHRUB-ALLIUM POLYRRHIZUM DESERT STEPPE RANGELAND IN SALINE PLAIN ESG, DESERT STEPPE



13. DISTRIBUTION OF STIPA GOBICA/GLAREOSA-SEMI-SHRUB-ALLIUM POLYRRHIZUM DESERT STEPPE
RANGELAND IN SALINE PLAIN ESG, DESERT STEPPE



Legend

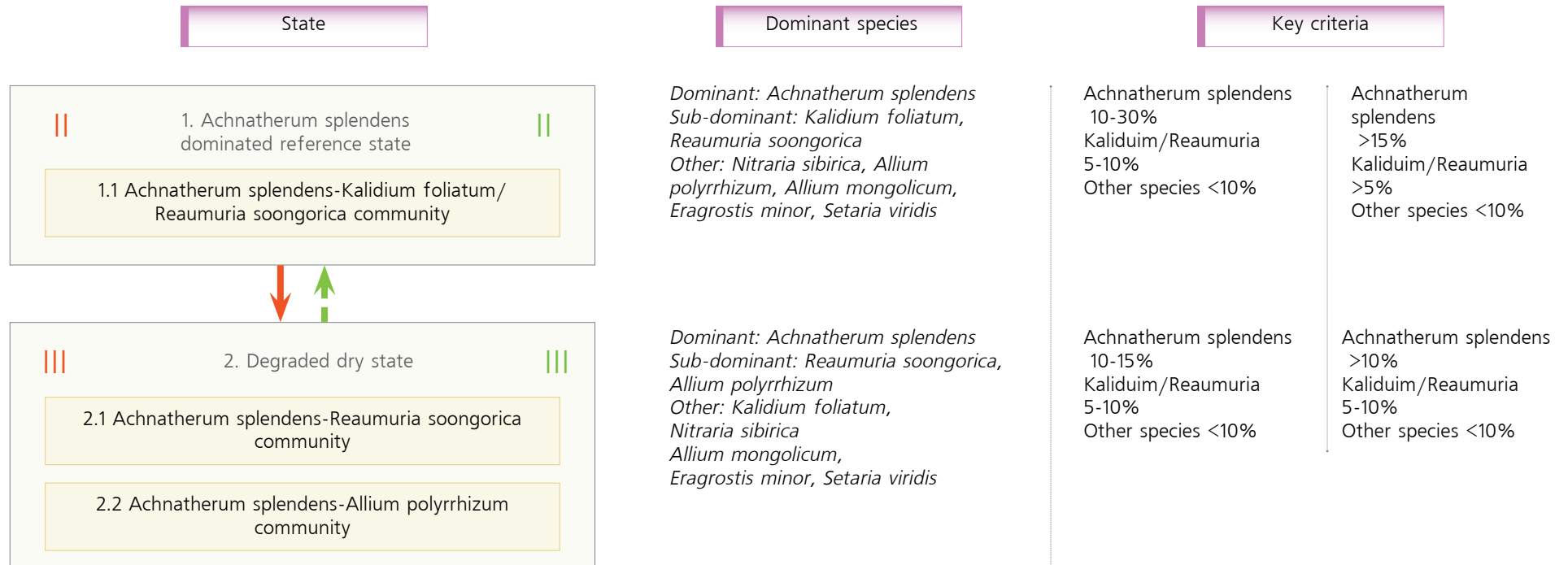
- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km



Projection: WGS 1984
UTM Zone 48N

14. ACHNATHERUM SPLENDENS-KALIDIUM FOLIATUM/REAUMURIA SOONGORICA DESERT STEPPE RANGELAND IN SOLANCHAK LOWLAND ESG, DESERT STEPPE



14. ACHNATHERUM SPLENDENS-KALIDIUM FOLIATUM/REAUMURIA SOONGORICA DESERT STEPPE RANGELAND IN SOLANCHAK LOWLAND ESG, DESERT STEPPE

1. *Achnatherum splendens* dominated reference state



1.1 *Achnatherum splendens*-*Kalidium foliatum*/*Reaumuria soongorica* community



Achnatherum splendens



Kalidium foliatum



Allium mongolicum

Yield: 270-380 kg/ha; RCC: 15-22 sheep unit/100ha



2. Degraded dry state



2.1 *Achnatherum splendens*-*Reaumuria soongorica* community



Reaumuria soongorica

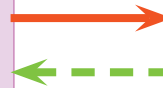


Allium polyrrhizum

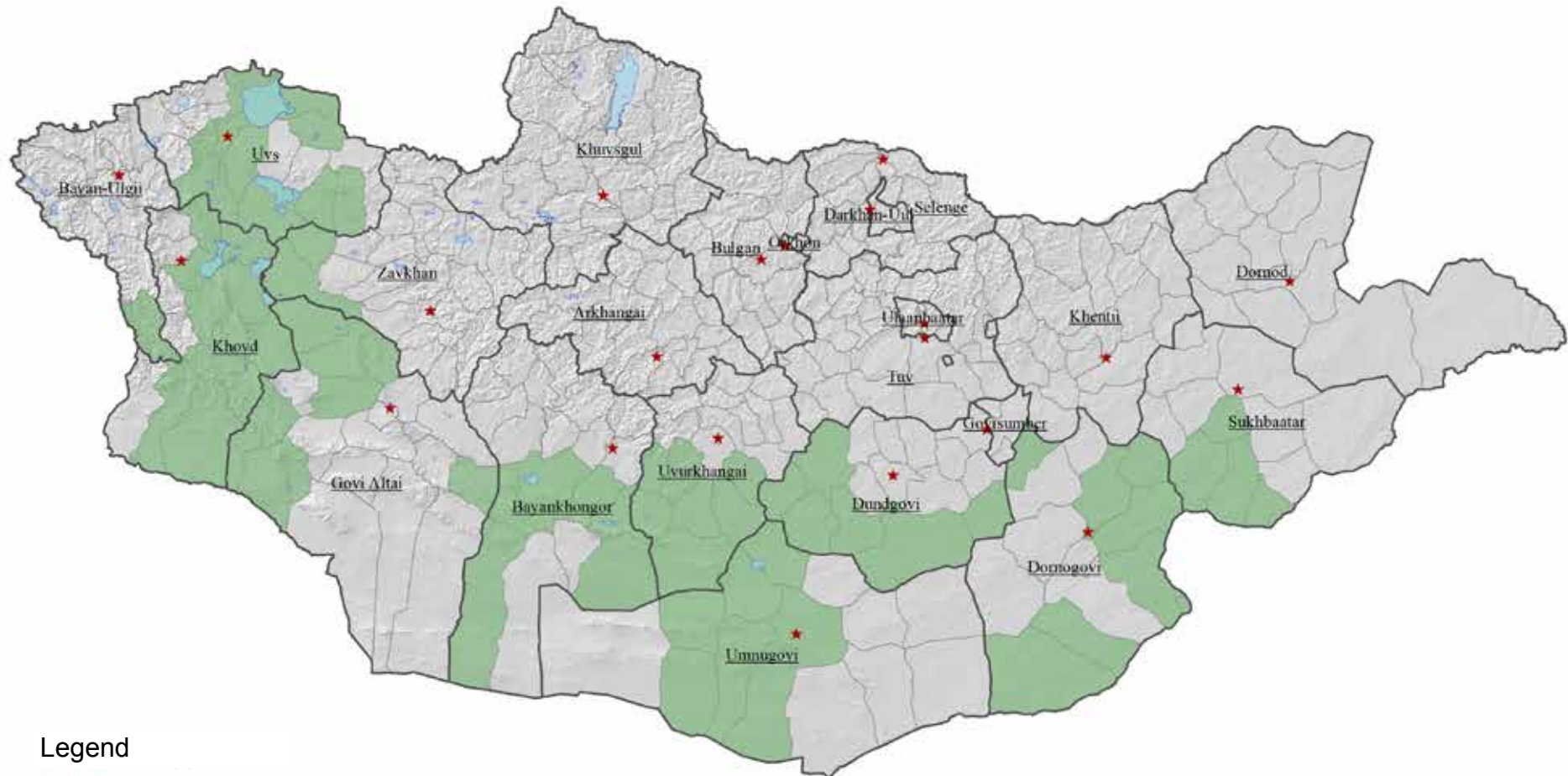


Setaria viridis

Yield: 270-380 kg/ha; RCC: 15-22 sheep unit/100ha



14. DISTRIBUTION OF *ACHNATHERUM SPLENDENS*-*KALIDIUM FOLIATUM*/*REaumURIA SOONGORICA* DESERT STEPPE RANGELAND IN SOLANCHAK LOWLAND ESG, DESERT STEPPE



Legend

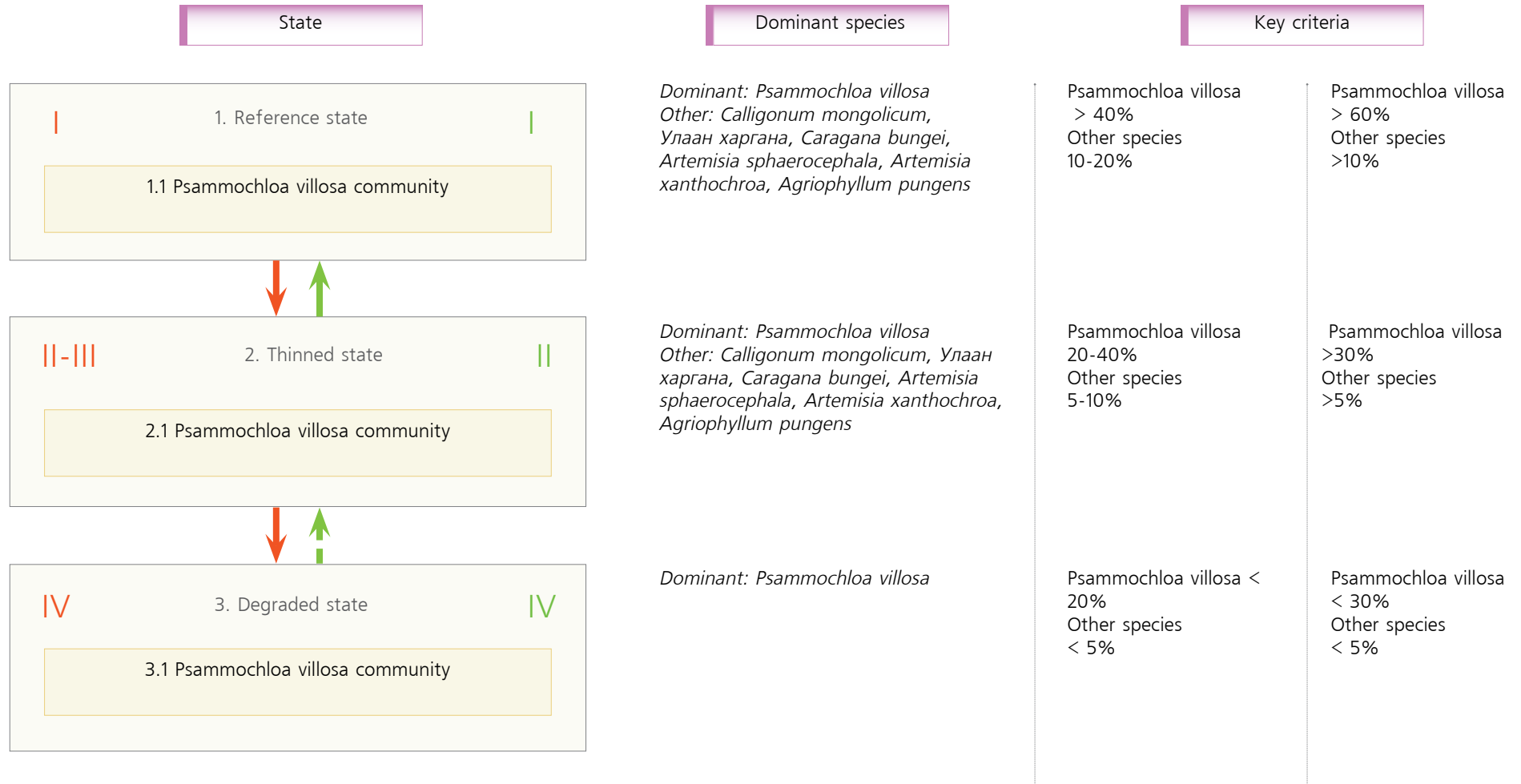
- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km

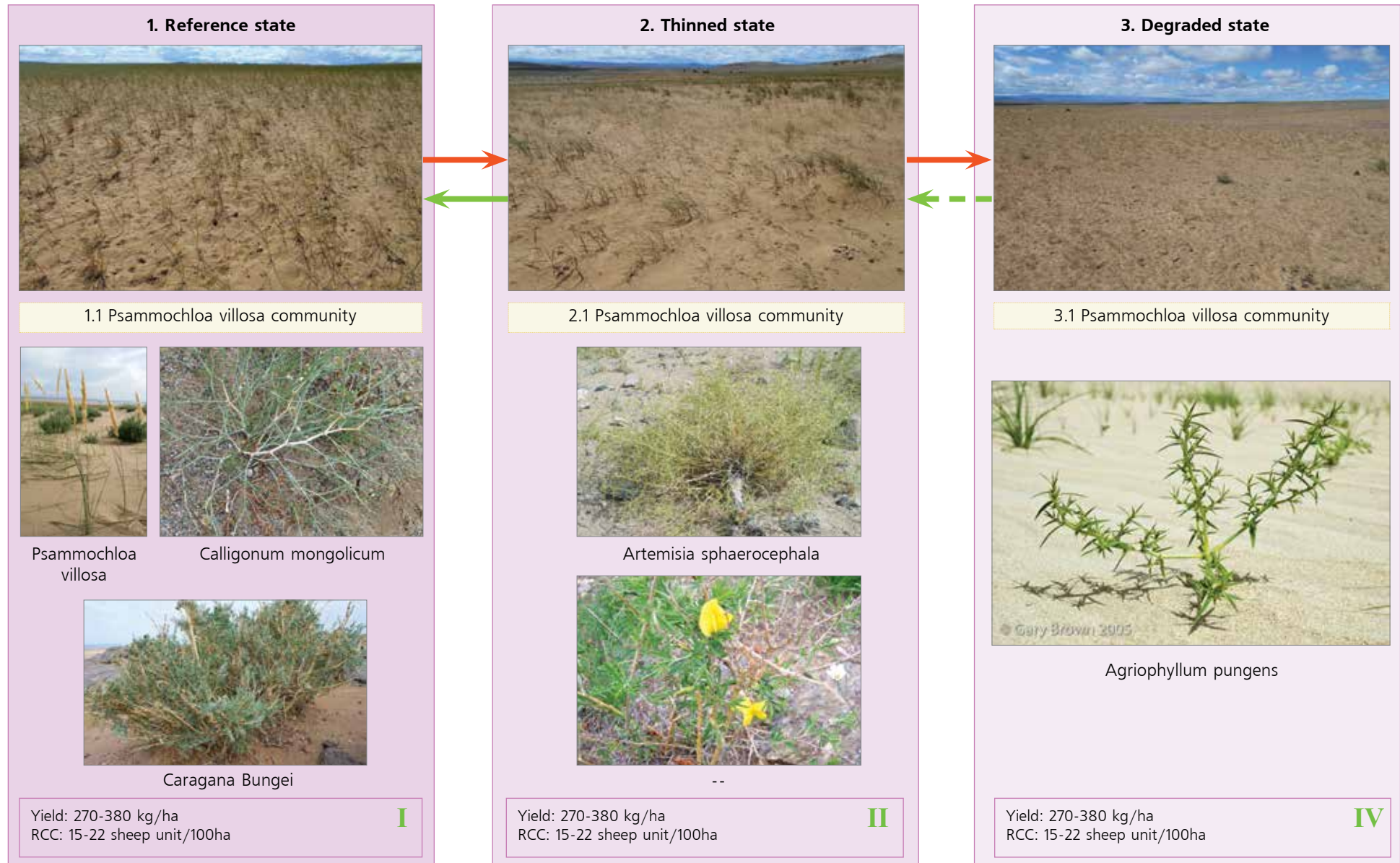


Projection: WGS 1984
UTM Zone 48N

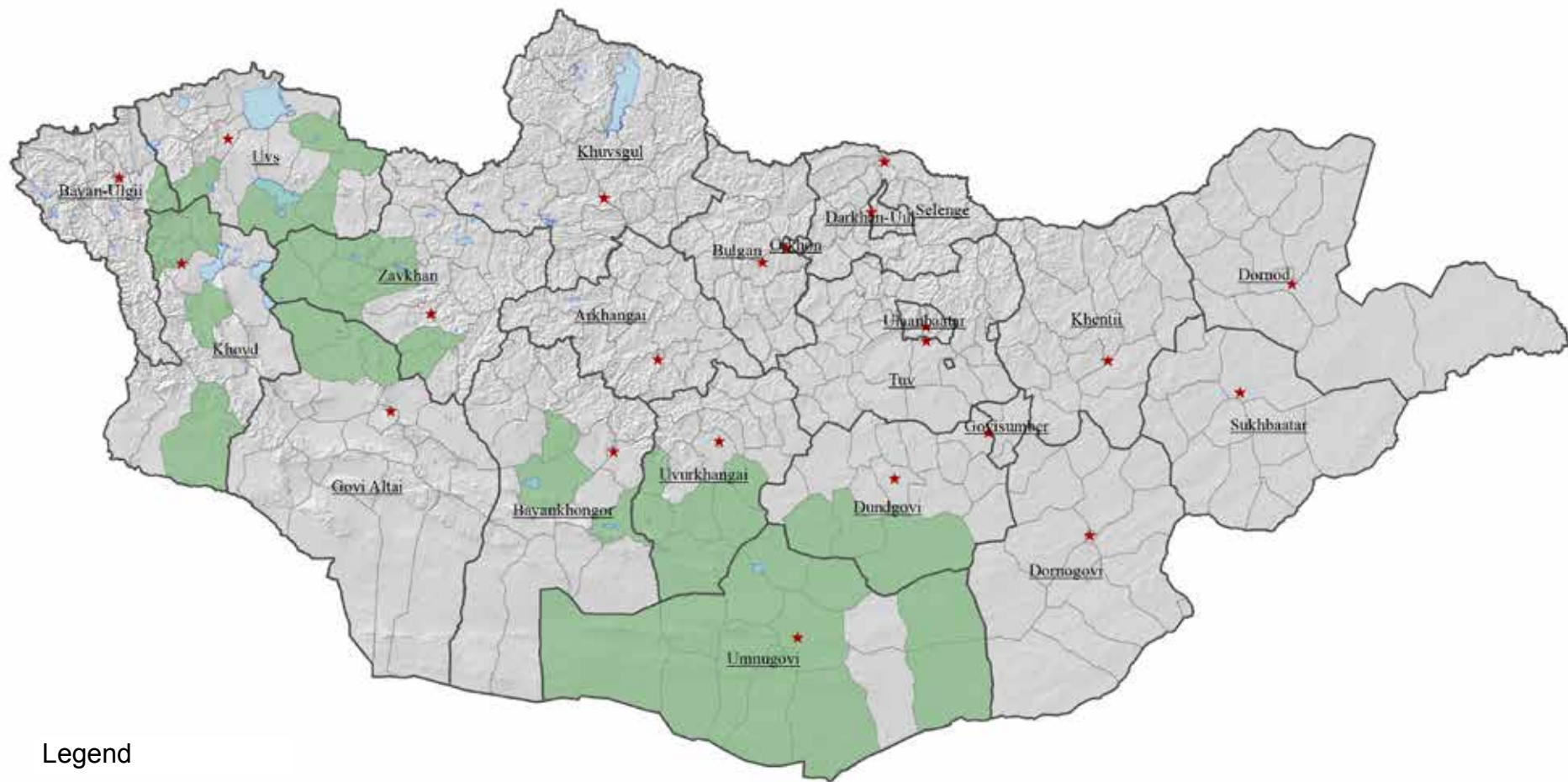
15. PSAMMOCHLOA VILLOSA DESERT STEPPE RANGELAND IN DEEP SANDY PLAIN ESG, DESERT STEPPE



15. PSAMMOCHLOA VILLOSA RANGELAND IN DEEP SANDY PLAIN ESG, DESERT STEPPE



15. DISTRIBUTION OF PSAMMOCHLOA VILLOSA RANGELAND IN DEEP SANDY PLAIN ESG, DESERT STEPPE



Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km



Projection: WGS 1984
UTM Zone 48N

DESERT ZONE

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graph TD; A[DESERT ZONE] --> B[GRAVELLY HILLS]; A --> C[GRAVELLY PLAIN]; A --> D[DEEP SANDY PLAIN]; A --> E[SOLANCHAK LOWLAND]; B --> B1["16. Sympegma regelii-Anabasis brevifolia desert rangeland in Gravelly hills ESG, Desert"]; C --> C1["17. Semi-shrub desert rangeland in Gravelly plain ESG, Desert"]; D --> D1["18. Haloxylon ammodendron rangeland in Deep sandy plain, Desert"]; E --> E1["19. Nitraria spp.-Haloxylon ammodendron desert rangeland in Solanchak lowland, Desert"];
```

GRAVELLY HILLS

16. *Sympegma regelii*-*Anabasis brevifolia* desert rangeland in Gravelly hills ESG, Desert

GRAVELLY PLAIN

17. Semi-shrub desert rangeland in Gravelly plain ESG, Desert

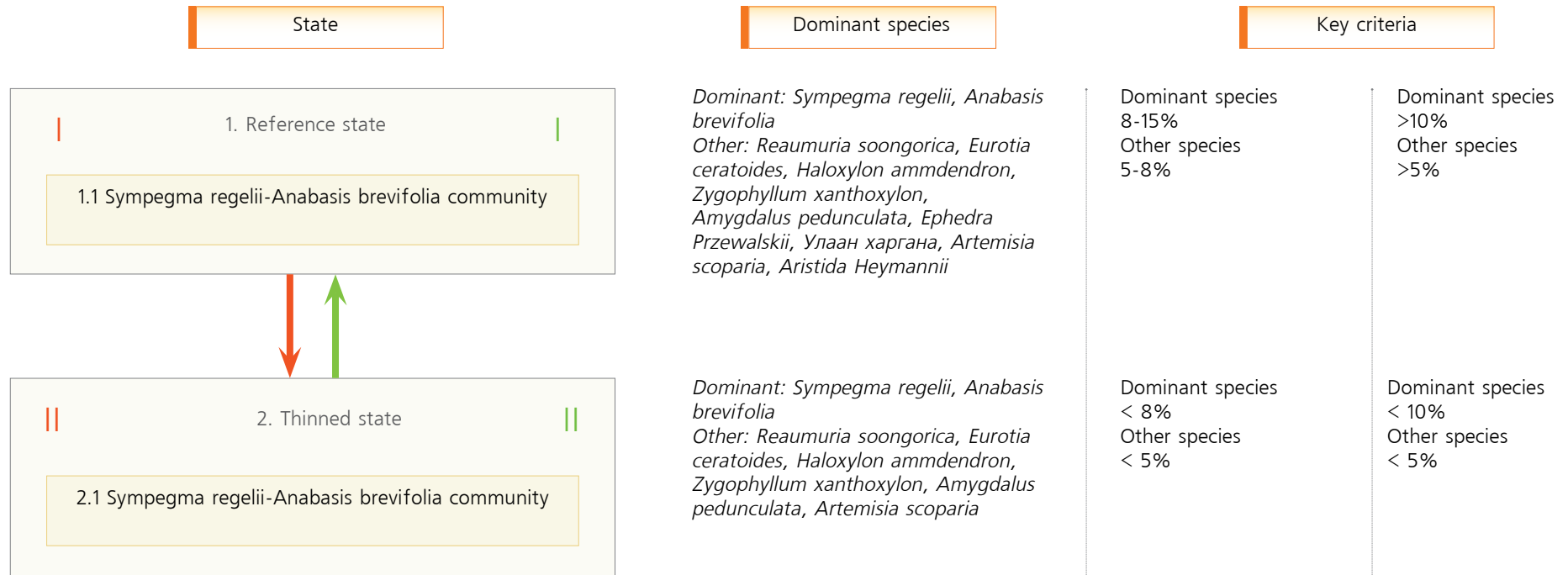
DEEP SANDY PLAIN

18. *Haloxylon ammodendron* rangeland in Deep sandy plain, Desert

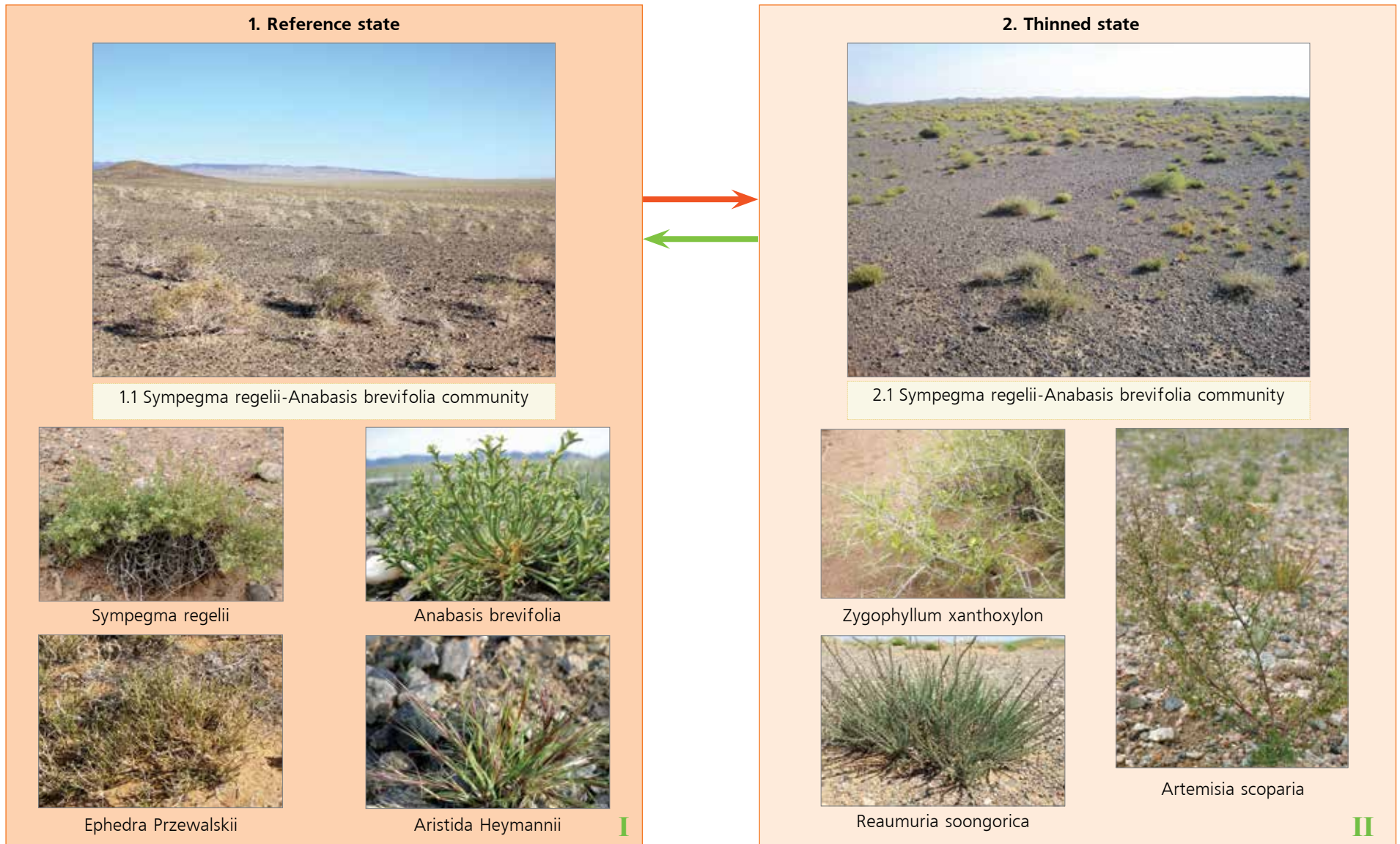
SOLANCHAK LOWLAND

19. *Nitraria* spp.-*Haloxylon ammodendron* desert rangeland in Solanchak lowland, Desert

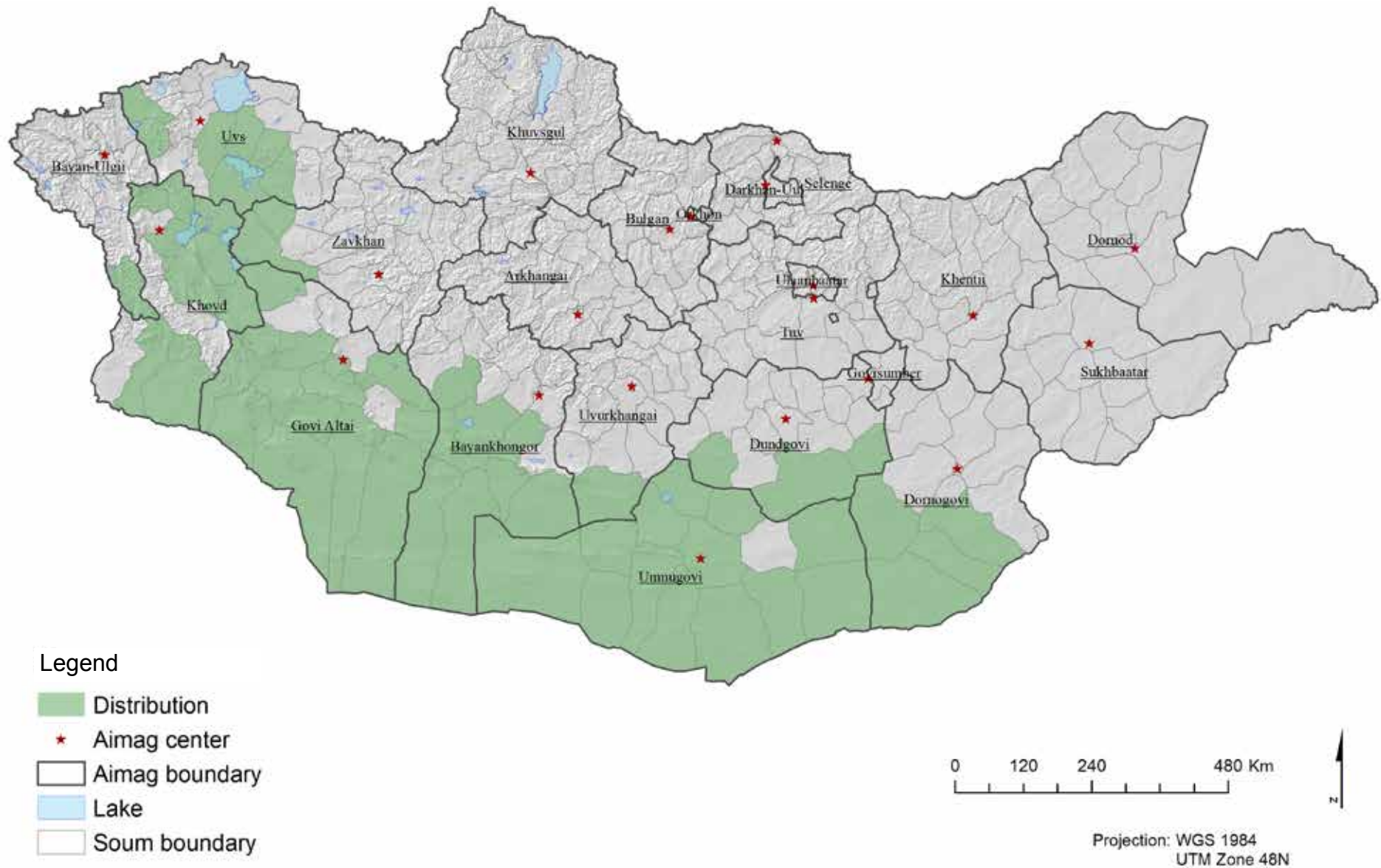
16. SYMPEGMA REGELII-ANABASIS BREVIFOLIA DESERT RANGELAND IN GRAVELLY HILLS ESG, DESERT



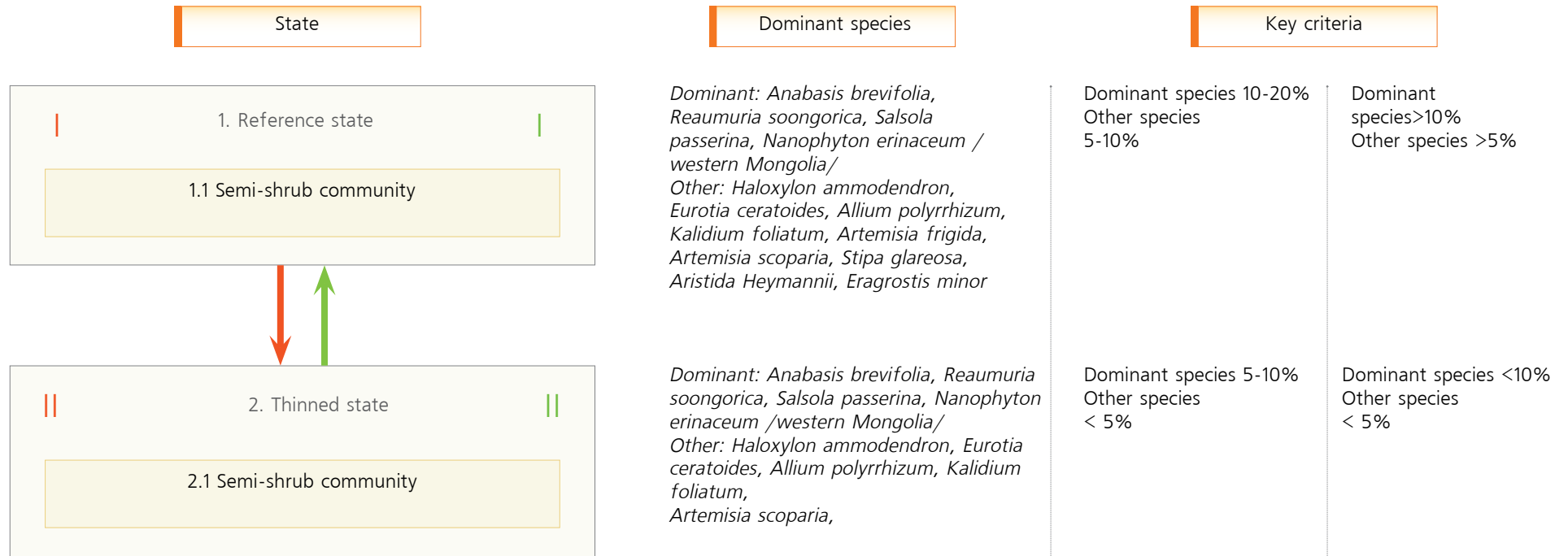
16. SYMEGMA REGELII-ANABASIS BREVIFOLIA DESERT RANGELAND IN GRAVELLY HILLS ESG, DESERT



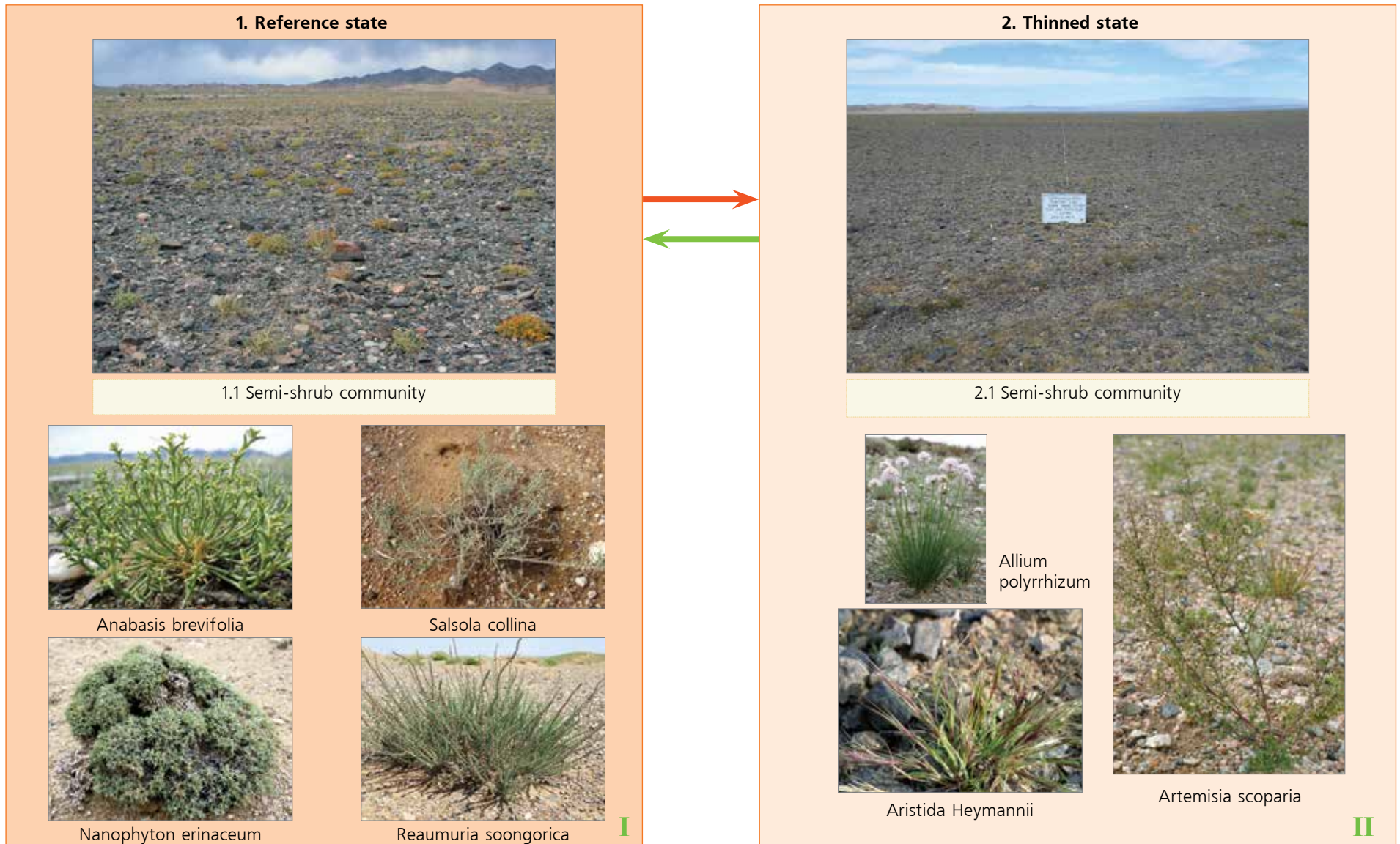
16. DISTRIBUTION OF SYMPEGMA REGELII-ANABASIS BREVIFOLIA DESERT RANGELAND IN GRAVELLY HILLS ESG, DESERT



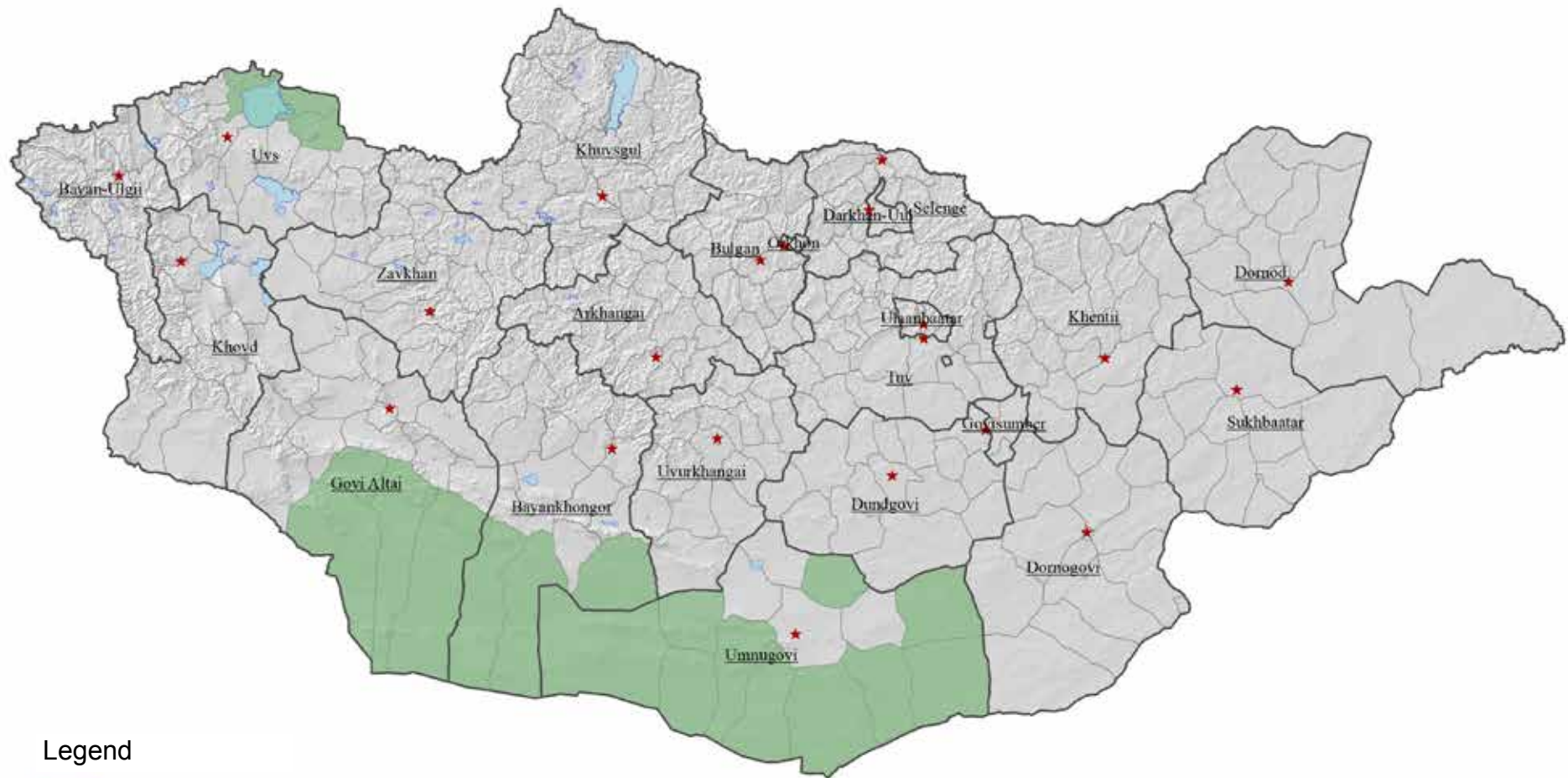
17. SEMI-SHRUB DESERT RANGELAND IN GRAVELLY PLAIN ESG, DESERT



17. SEMI-SHRUB DESERT RANGELAND IN GRAVELLY PLAIN ESG, DESERT

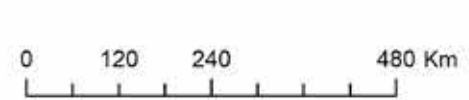


17. DISTRIBUTION OF SEMI-SHRUB DESERT RANGELAND IN GRAVELLY PLAIN ESG, DESERT



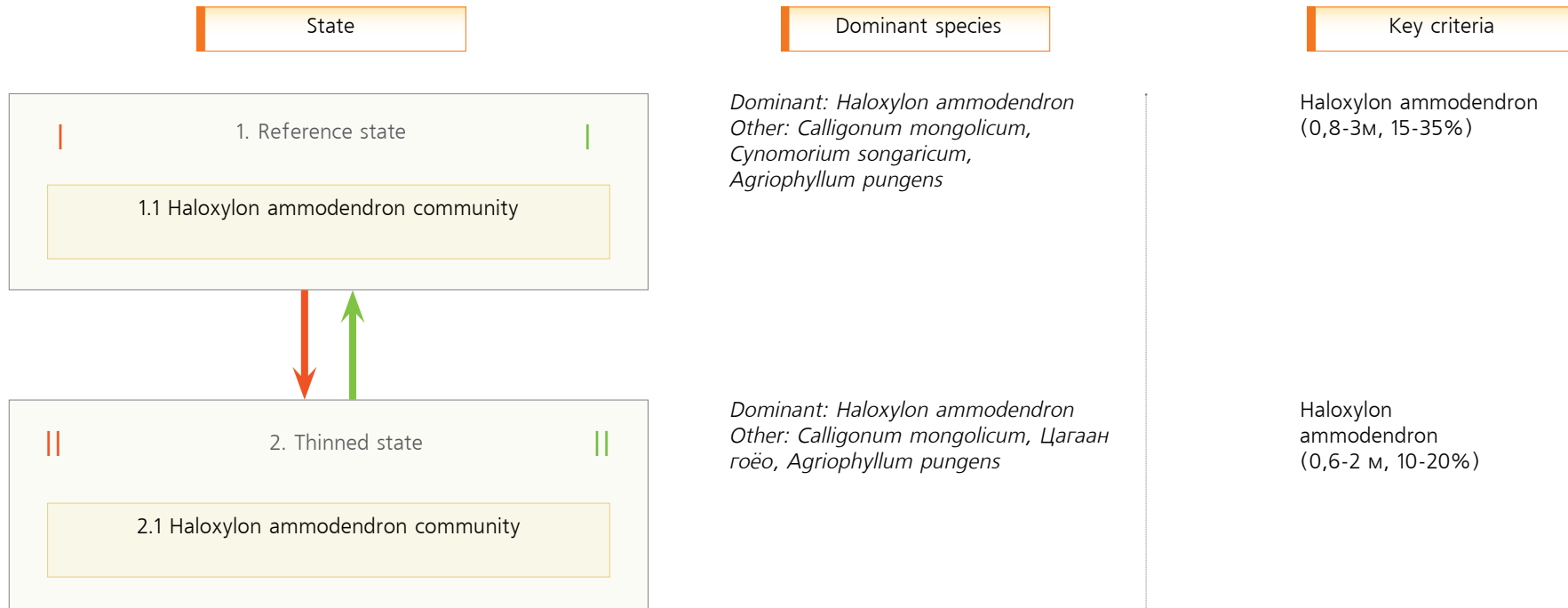
Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary



Projection: WGS 1984
UTM Zone 48N

18. HALOXYLON AMMODENDRON RANGELAND IN DEEP SANDY PLAIN, DESERT



18. HALOXYLON AMMODENDRON RANGELAND IN DEEP SANDY PLAIN, DESERT

1. Reference state



1.1 Haloxylon ammodendron community



Haloxylon ammodendron



Calligonum mongolicum

I

2. Thinned state



2.1 Haloxylon ammodendron community

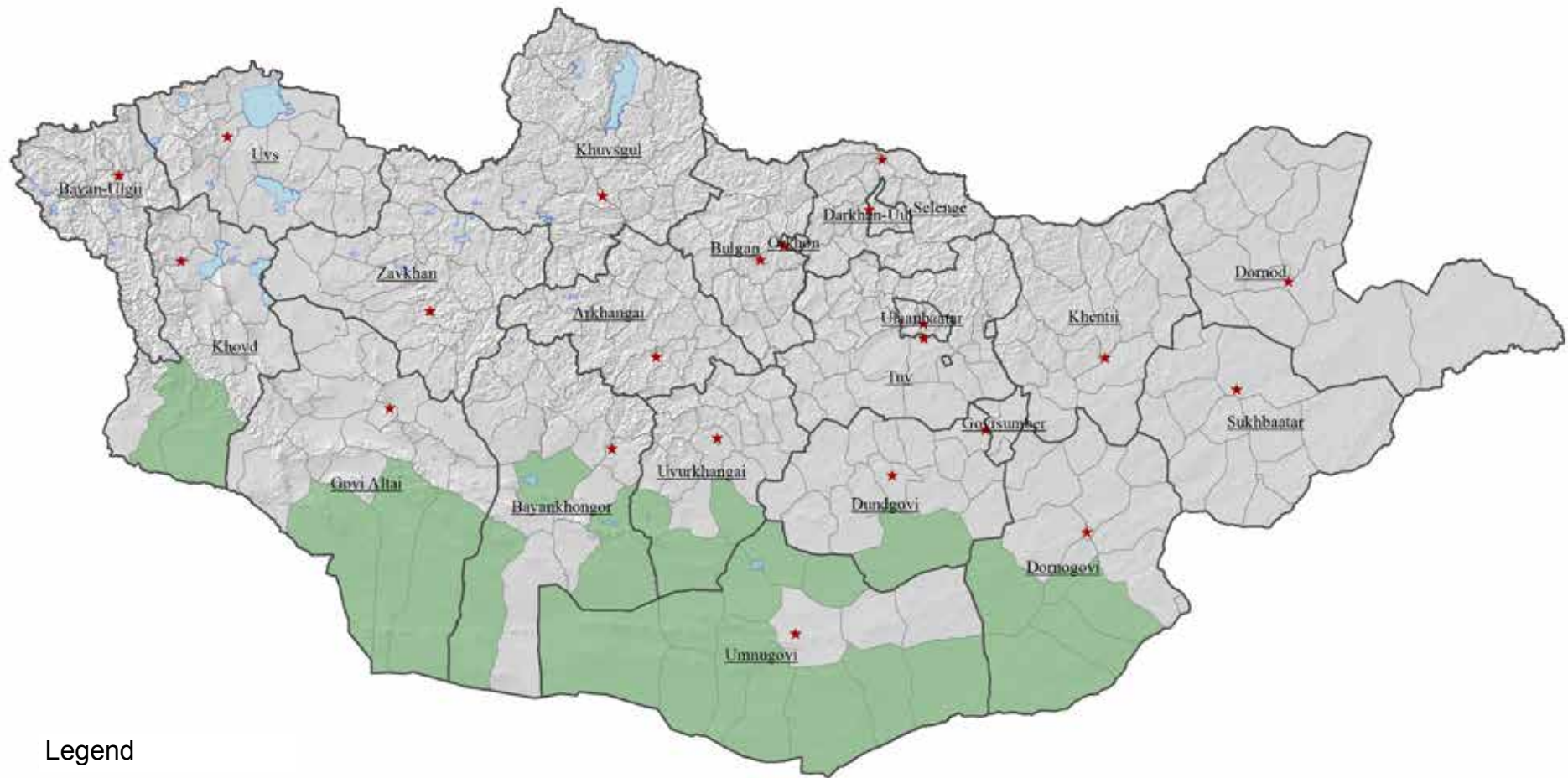


Cynomorium songaricum

II



18. DISTRIBUTION OF HALOXYLON AMMODENDRON RANGELAND IN DEEP SANDY PLAIN, DESERT



Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km



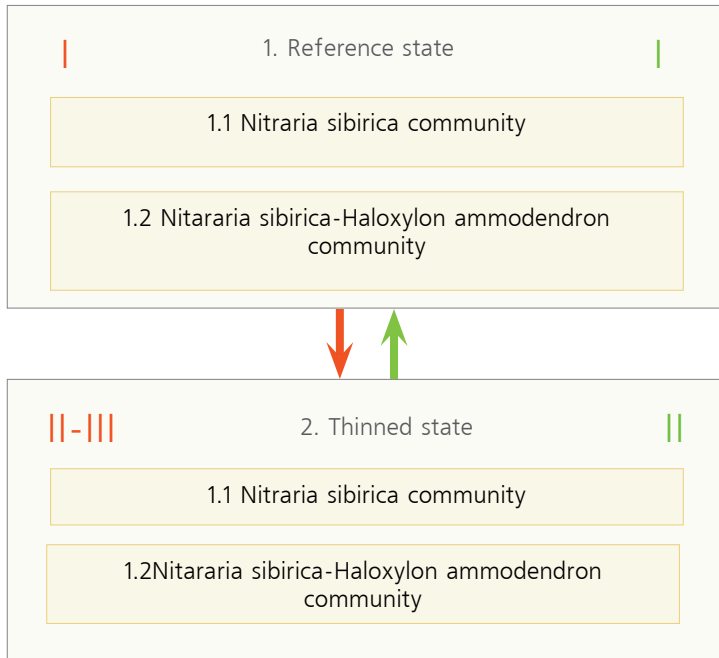
Projection: WGS 1984
UTM Zone 48N

19. NITRARIA SPP.-HALOXYLON AMMODENDRON DESERT RANGELAND IN SOLANCHAK LOWLAND, DESERT

State

Dominant species

Key criteria



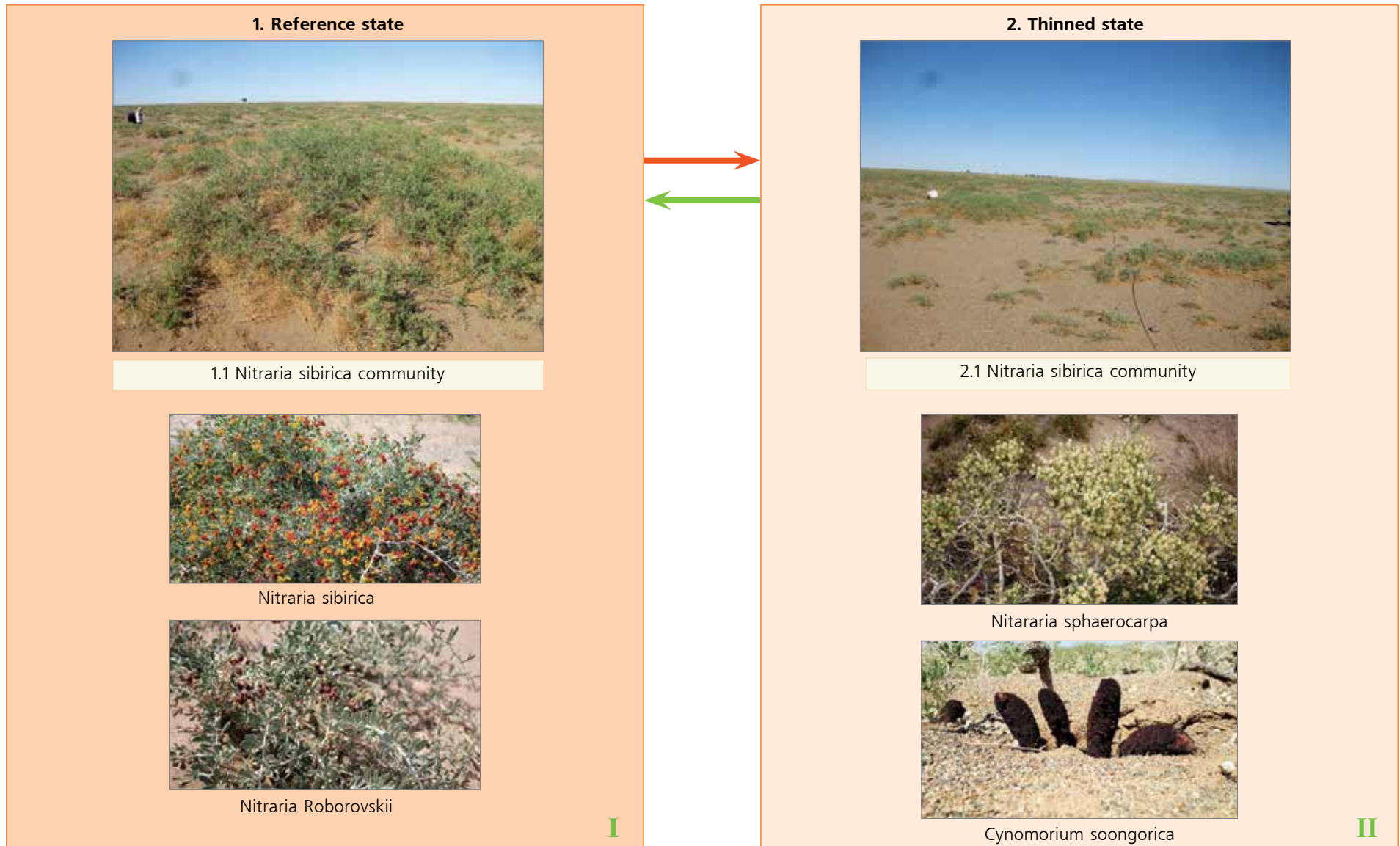
Dominant: *Nitraria sibirica*, *Nitraria sphaerocarpa* /western part of Gobi/ , *Nitraria Roborovskii*
 Sub-dominant: *Haloxylon ammodendron*
 Other: *Lycium ruthenicum*, *Achnatherum splendens*, *Scirpus Hippolytii*, *Glycyrrhiza uralensis*, *Cynomorium songaricum*, *Tamarix sp.*

Nitraria spp.15-35%
 Other species <10%

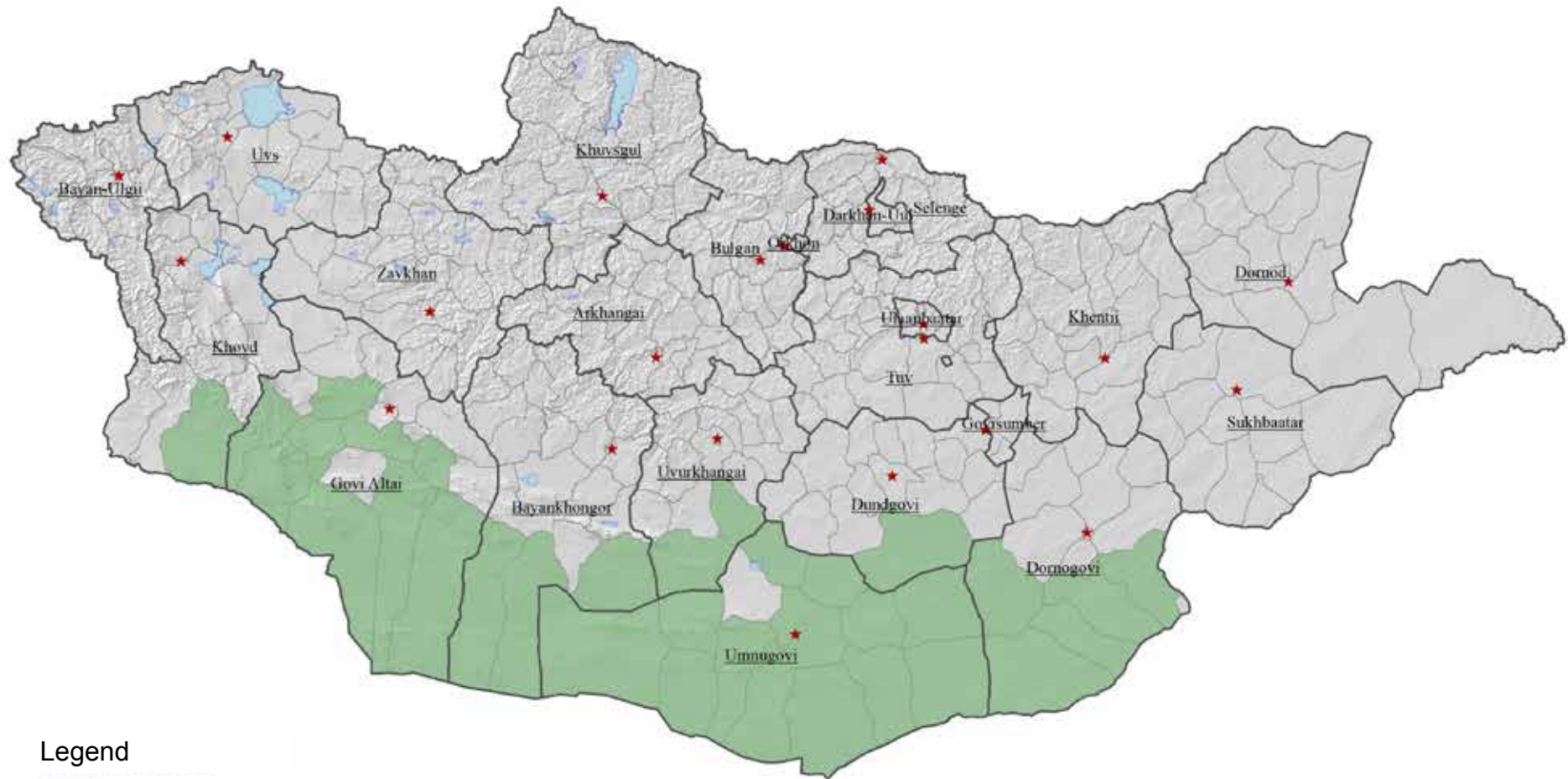
Dominant: *Nitraria sibirica*, *Nitraria sphaerocarpa* /western part of Gobi/ , *Nitraria Roborovskii*
 Sub-dominant: *Haloxylon ammodendron*
 Other: *Lycium ruthenicum*, *Achnatherum splendens*, *Scirpus Hippolytii*, *Glycyrrhiza uralensis*, *Cynomorium songaricum*, *Tamarix sp.*

Nitraria spp. 5-25%
 Other species <10%

19. NITRARIA SPP.-HALOXYLON AMMODENDRON DESERT RANGELAND IN SOLANCHAK LOWLAND, DESERT

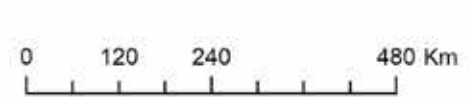


19. DISTRIBUTION OF NITRARIA SPP.-HALOXYLON AMMODENDRON DESERT RANGELAND IN SOLANCHAK LOWLAND, DESERT



Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary



Projection: WGS 1984
UTM Zone 48N

HIGH MOUNTAIN ZONE

**GRAVELLY HILLS
(MONGOL-ALTAI MOUNTAIN
2650-3200 M)**

20. Cryophyte forbs-Small bunch grass high mountain steppe rangeland in Gravelly hills ESG, High mountain

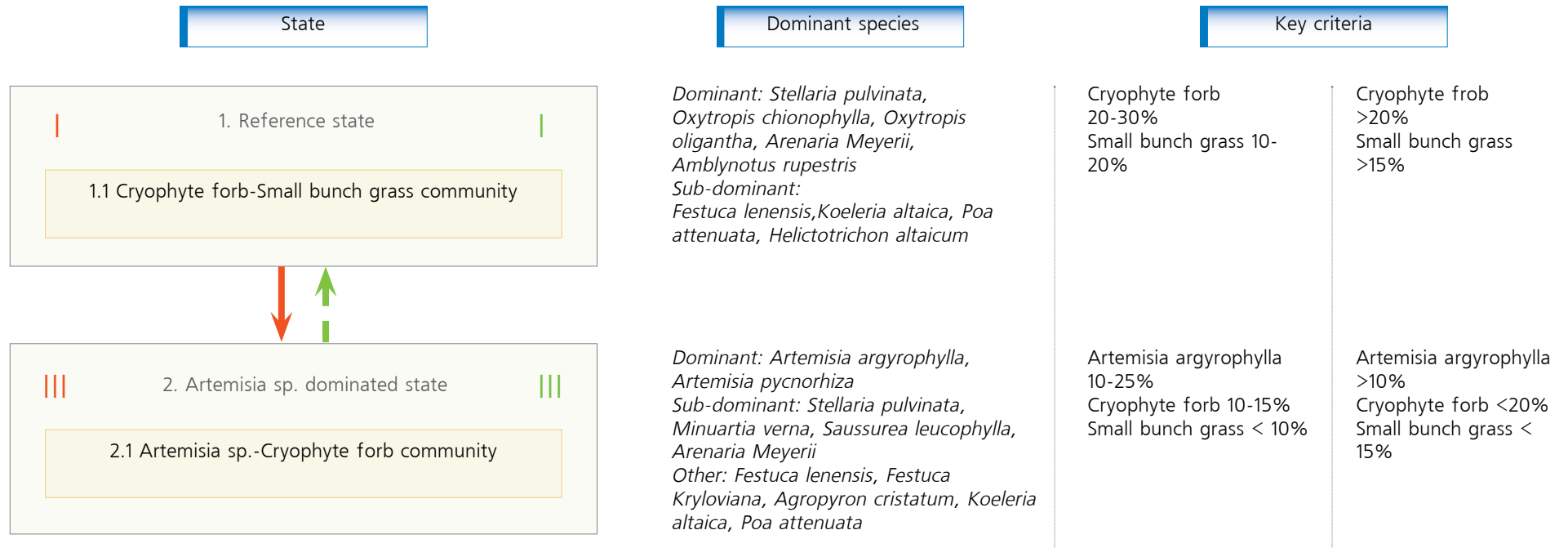
**ALLUVIAL FAN /XEROPHYTE/
(MONGOL-ALTAI MOUNTAIN
2850-3050 M),
KHANGAI MOUNTAIN (2520-
2850 M)**

21. Festuca spp.-Cryophyte forbs high mountain steppe rangeland in Gravelly hills ESG, High mountain

**MOUNTAIN MEADOW /
MESOPHYTE/
(MONGOL ALTAI MOUNTAIN
(2300-2600 M)**

22. Tall bunch grass-Xero-mesophyte forbs with shrub high mountain meadow rangeland in High water table ESG, High mountain

20. CRYOPHYTE FORBS-SMALL BUNCH GRASS HIGH MOUNTAIN STEPPE RANGELAND IN GRAVELLY HILLS ESG, HIGH MOUNTAIN



20. CRYOPHYTE FORBS-SMALL BUNCH GRASS HIGH MOUNTAIN STEPPE
RANGELAND IN GRAVELLY HILLS ESG, HIGH MOUNTAIN

1. Reference state



1.1 Cryophyte forb-Small bunch grass community



Oxytropis chionophylla



Koeleria altaica



Festuca lenensis



Oxytropis oligantha

I



2. Artemisia sp. dominated state



2.1 Artemisia sp.-Cryophyte forb community



Artemisia argyrophylla



Artemisia pycnorhiza



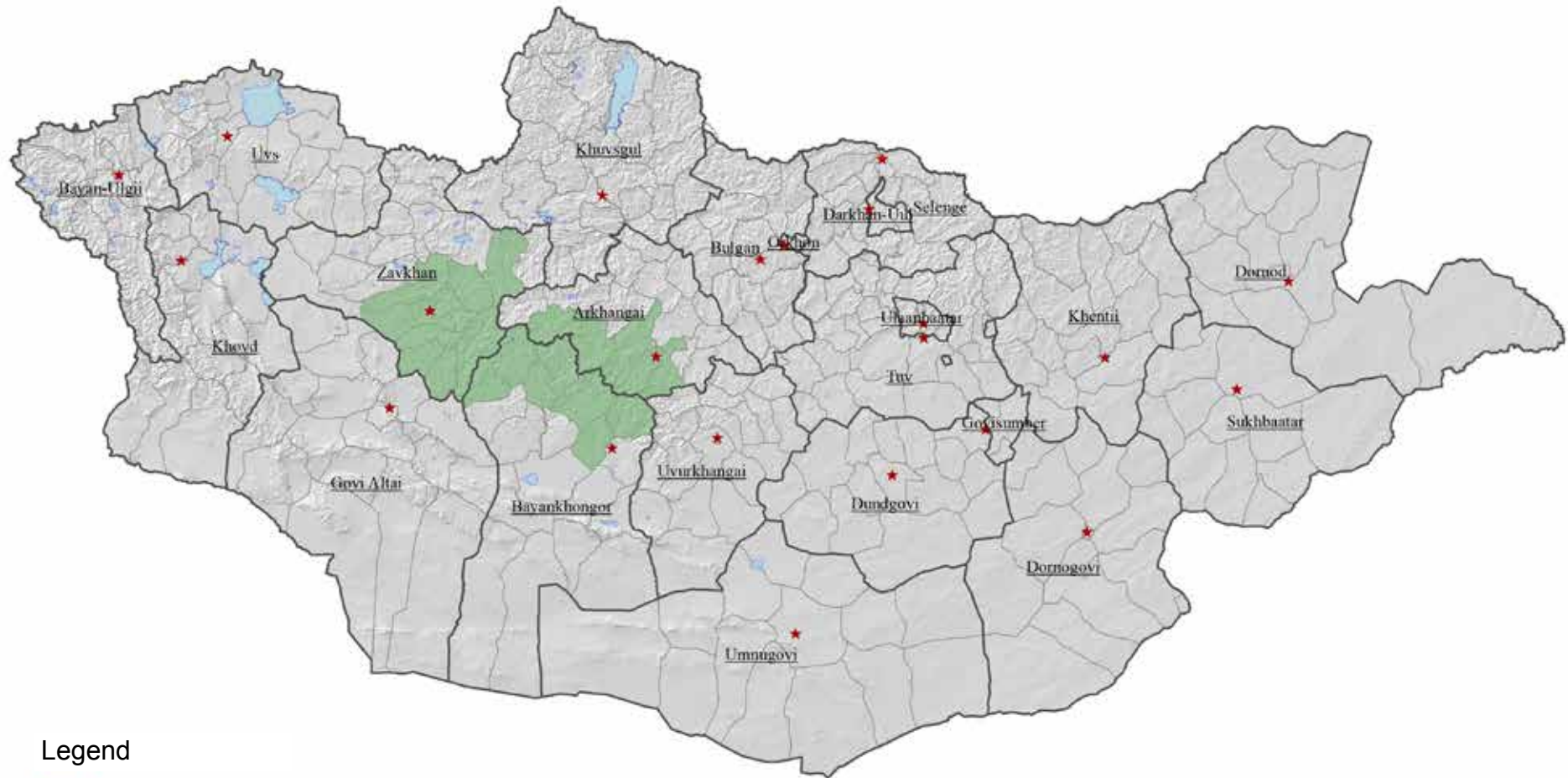
Arenaria Meyerii



Stellaria pulvinata

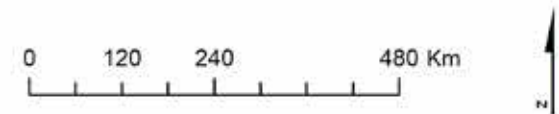
III

20. DISTRIBUTION OF CRYOPHYTE FORBS-SMALL BUNCH GRASS HIGH MOUNTAIN STEPPE RANGELAND IN GRAVELLY HILLS ESG, HIGH MOUNTAIN



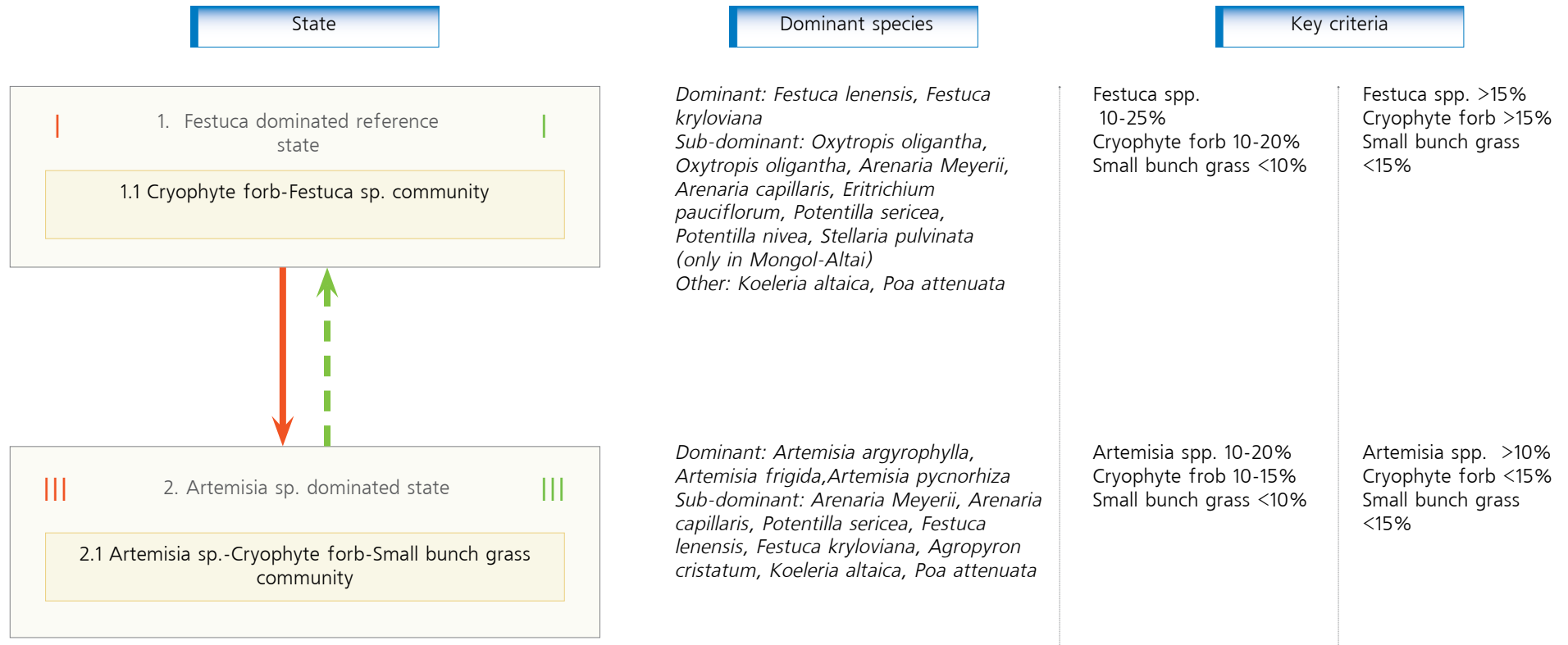
Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary



Projection: WGS 1984
UTM Zone 48N

21. FESTUCA SPP.-CRYOPHYTE FORBS HIGH MOUNTAIN STEPPE
RANGELAND IN GRAVELLY HILLS ESG, HIGH MOUNTAIN



21. FESTUCA SPP.-CRYOPHYTE FORBS HIGH MOUNTAIN STEPPE
RANGELAND IN GRAVELLY HILLS ESG, HIGH MOUNTAIN

1. Festuca dominated reference state



1.1 Cryophyte forb-Festuca sp. community



Festuca kryloviana



Festuca lenensis



Oxytropis chionophylla

I



3. Artemisia sp. dominated state



3.1 Artemisia sp.-Cryophyte forb-Small bunch grass community



Artemisia argyrophylla



Artemisia pycnorhiza



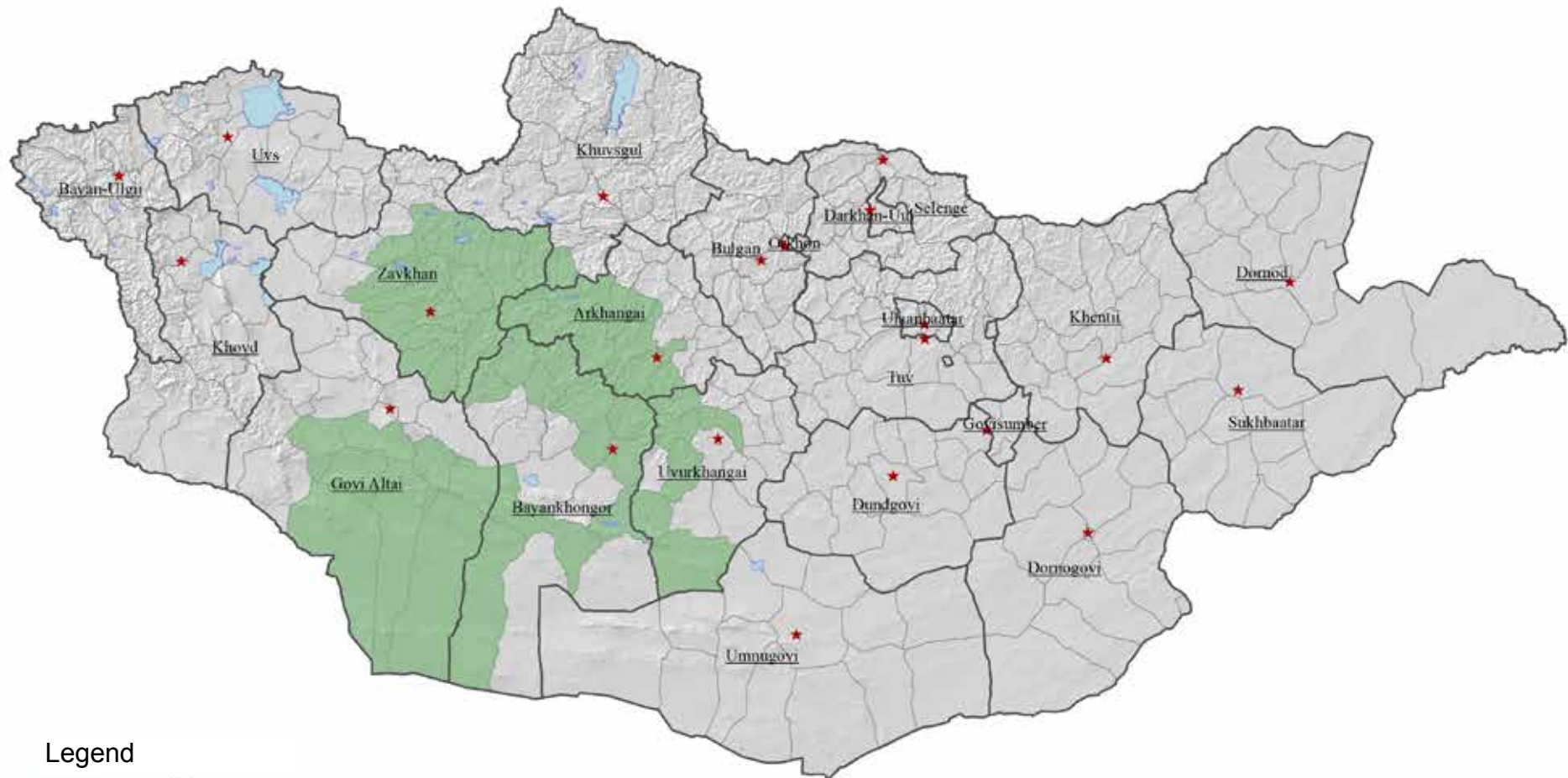
Potentilla sericea



Arenaria Meyerii

III

21. DISTRIBUTION OF FESTUCA SPP.-CRYOPHYTE FORBS HIGH MOUNTAIN STEPPE
RANGELAND IN GRAVELLY HILLS ESG, HIGH MOUNTAIN



Legend

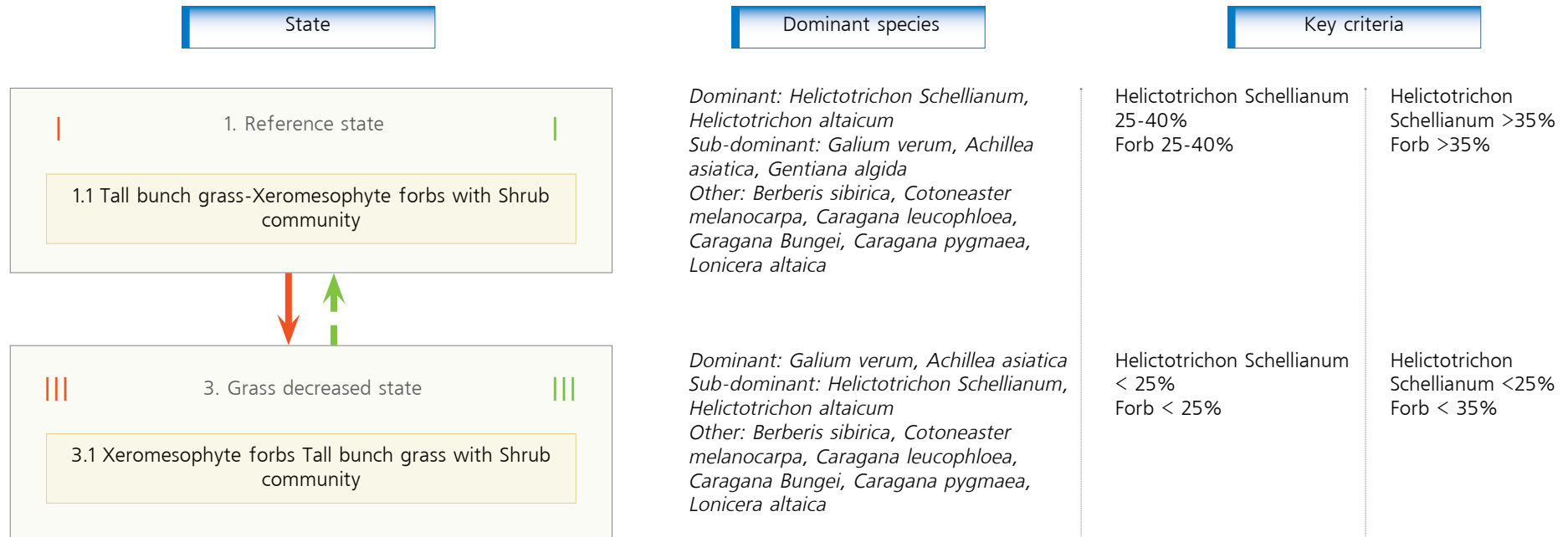
- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km



Projection: WGS 1984
UTM Zone 48N

22. TALL BUNCH GRASS-XEROMESOPHYTE FORBS WITH SHRUB HIGH MOUNTAIN MEADOW RANGELAND IN HIGH WATER TABLE ESG, HIGH MOUNTAIN



22. TALL BUNCH GRASS-XERO-MESOPHYTE FORBS WITH SHRUB HIGH MOUNTAIN MEADOW RANGELAND IN HIGH WATER TABLE ESG, HIGH MOUNTAIN

1. Reference state



1.1 Tall bunch grass-Xeromesophyte forbs with Shrub community



Helictotrichon schellianum

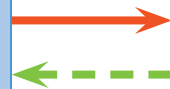


Cotoneaster melanocarpa



Achillea asiatica

I



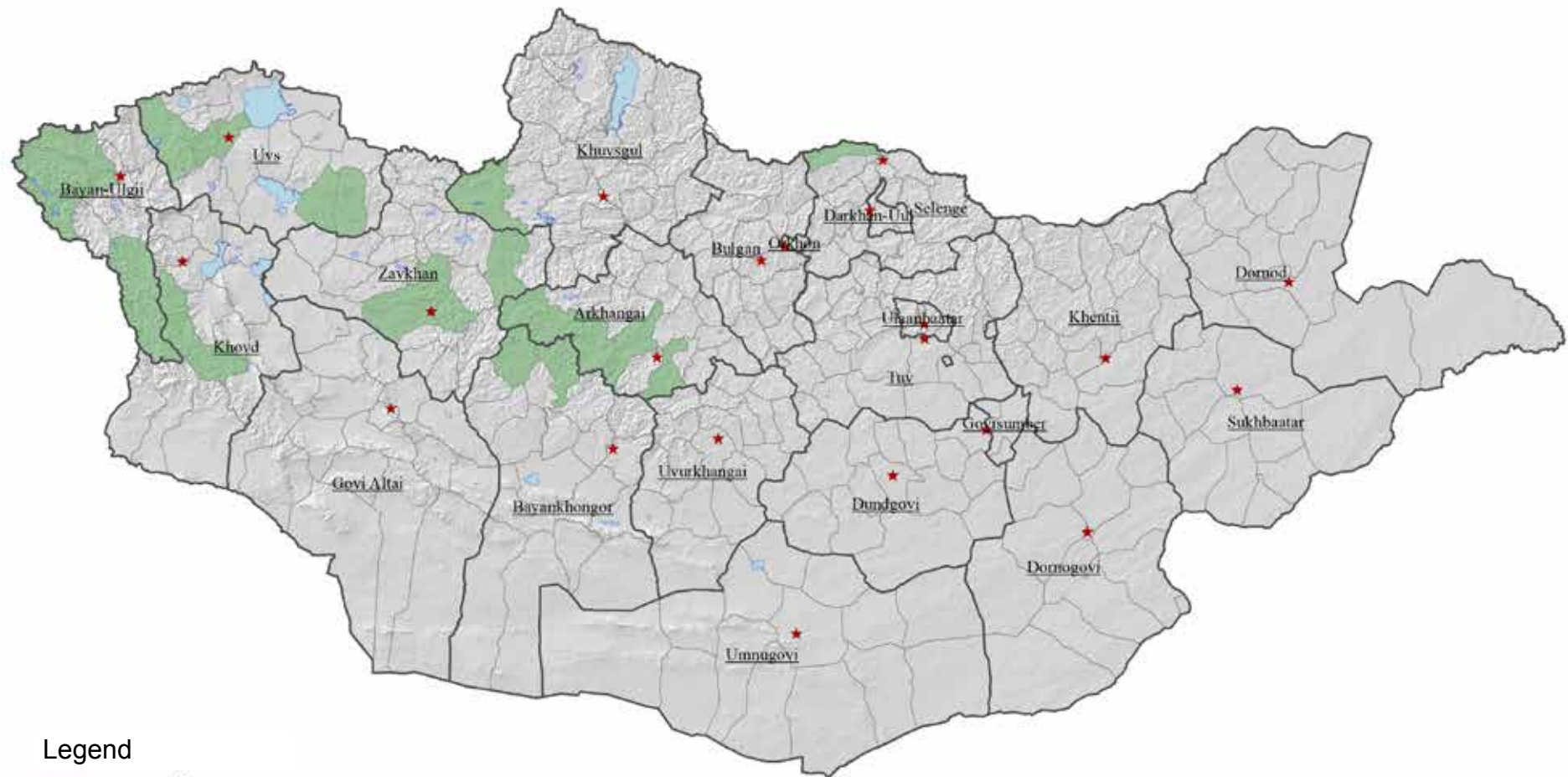
2. Grass decreased state



2.1 Xeromesophyte forbs - Tall bunch grass with Shrub community

III

22. DISTRIBUTION OF TALL BUNCH GRASS-XERO-MESOPHYTE FORBS WITH SHRUB HIGH MOUNTAIN MEADOW RANGELAND IN HIGH WATER TABLE ESG, HIGH MOUNTAIN



Legend

- Distribution
- Aimag center
- Aimag boundary
- Lake
- Soum boundary

0 120 240 480 Km



Projection: WGS 1984
UTM Zone 48N

RECOMMENDATIONS FOR PROPER MANAGEMENT:

Rangeland management practices are built more on the acceptable utilization rates grazed vegetation that vary depending on recovery classes, time of year and rest periods provided for. The concept of Resilient Carrying Capacity incorporates all the available knowledge, research and application, to estimate a carrying capacity that will provide for ecological function while providing a sustainable level of livestock health and production of meat and fiber. The combination of harvest efficiency, forage production, forage intake and livestock production as well as erosion control and watershed function will be maintained or enhanced by a Resilient Carrying Capacity.

Rangeland communities in the State 1 will have a management objective of maintenance of the existing community or of the maintenance of the dynamics that ensure that the plant communities remain in State 1. Rangeland communities in all other alternative states will have a management objective based on reclamation of the function of State 1. Resilient Carrying Capacities, management recommendations and stocking rates will be based on the above principle and the recovery class of each community phase

<p>Recovery Class I: The primary management objective will be maintenance of State 1 conditions. This will be accomplished by adjustment of stocking rates to match the Resilient Carrying Capacity computed (as illustrated above) for the grazing area. As long as the area remains in State 1 conditions, this will be sufficient adjustment to meet the management objective.</p>	<p>Recovery Class II: The primary management objective will be restoration of State 1 conditions. This will be achieved by a stocking rate that is 5% below Resilient Carrying Capacity. This stocking rate will be maintained until State 1 conditions are achieved. When State 1 conditions are achieved, stocking rates may be increased to match the Resilient Carrying Capacity. Improvement may be accelerated by adjusting and alternating the timing of grazing within the seasonal pastures (see example in Recovery Class III below).</p>	<p>Recovery Class III: The primary management objective will be restoration of State 1 conditions. This will be achieved by a stocking rate that is 10% below Resilient Carrying Capacity. Timing of grazing within seasonal pastures will be alternated rather than the entire area being grazed season long. The actual timing and location of grazing within the seasonal pastures will be planned during the annual planning process each year and will need to be specific for each seasonal pasture in each PUG. For example: The first year all grazing in the spring area will occur in the east portion of the area for the first half of the season, then moved to the west portion for the last part of the season. The following year, the west portion will be grazed during the first half of the season and the east portion during the last half of the season. This stocking rate and timing adjustments will be maintained for at least seven (7) years and until State 1 conditions are achieved. When State 1 conditions are achieved, stocking rates may be increased to match the Resilient Carrying Capacity.</p>	<p>Recovery Class IV: The primary objective will be restoration of State 1 conditions. This will be achieved by a combination of adjusting stocking rates and growing season deferment. Stocking rate will be set 15% below Resilient Carry Capacity and the areas will receive three (3) consecutive years of growing season deferment. Deferment will be from the initiation of growth in the spring until full seed set and senescence occurs. The area can then be grazed during the dormant season with the 15% of Resilient Carrying Capacity numbers. The first three (3) years of deferment will be followed by two (2) years of growing season grazing at the 15% of Resilient Carrying Capacity numbers, followed by three (3) years of growing season deferment, followed by two (2) years of growing season grazing. This pattern will continue for at least ten (10) years and until State 1 conditions are achieved. When State 1 conditions are achieved, stocking rates may be increased to match the Resilient Carrying Capacity and timing of grazing can be adjusted to fit overall management plan.</p>	<p>Recovery Class V: The primary objective will be erosion control and soil and vegetation stability. This will be achieved by applying a two (2) year rest period, followed by growing season deferment and a stocking rate 15% below the Resilient Carrying Capacity. All grazing will be removed for a period of two complete years from these areas. Following the second year, growing season deferment will be applied for the following three (3) consecutive seasons. Deferment will be from the initiation of growth in the spring until full seed set and senescence occurs. The area can then be grazed during the dormant season with the 15% of Resilient Carrying Capacity numbers. The first three (3) years of deferment will be followed by two (2) years of growing season grazing at the 15% of Resilient Carrying Capacity numbers, followed by three (3) years of growing season deferment, followed by two (2) years of growing season grazing. This pattern of management will continue for at least three (3) cycles of growing season deferment.</p>
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RECOMMENDATION #3

All stocking rate reductions and management actions identified above will be continued for the minimum time indicated and until the herders, PUG leaders and soum land managers all agree that State 1 conditions prevail or that additional stocking reductions or management actions are needed. State-and-Transition models for the ecological site groups will be used to interpret monitoring and assessment data for this determination

RECOMMENDATION #4

The herders and practitioners should use a stubble height measurement to help ensure that they are grazing the correct amount, moving out of an area at the correct time and moving into an area at the correct time. To ensure that the above identified management actions are successful, an average vegetation height of at least eight (8) cm should exist before moving into an area to begin grazing, animals should be moved out of the area when the average vegetation height is five (5) cm. Maintaining an average height of at least five (5) cm of vegetation height during the growing season is essential to plant health, soil fertility and stability and animal health.