

Description of the Northern Region Prioritization Model and  
an Application with Gallatin National Forest Data  
Henry Shovic  
Gallatin National Forest  
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This document discusses the logic of the Regional Integration Prioritization system and its application using Gallatin National Forest Data (2007) in addition to Regional data (vs 6-03).

From the Regional Office Integration Website:

The focus of the Northern Region strategy is to:

- Restore and maintain high value watersheds in a properly functioning condition.
- Restore and maintain wildlife habitats, including restoring more resilient vegetation conditions where appropriate, to meet ecological and social goals.
- Protect people, structures and community infra-structure (roads, bridges, and power corridors,) in and associated with the wildland-urban interface (WUI).
- Improve the integration of project proposals.

The strategy includes maps that depict the specific individual values at risk (to large scale geographic fires, loss of wildlife habitat due to invasive weeds and encroachment of trees onto native grasslands and shrub communities, and risks to water quality for beneficial uses) to assist in the identification of restoration and protection emphasis areas. Threats from specific invasive species are to be considered at a finer, project scale. This resource program information and integration along with other local information is intended to help Forest and Grassland units in the Northern Region to develop integrated projects with a solid purpose and need for action in both time and space (e.g. why here and why now).

The focus of the assessment is identifying values that are directly threatened by potential large geographic scale fires, restoration and maintenance of watersheds and fish habitat, and maintaining resilient vegetation conditions that maintain or restore wildlife habitat, especially big game winter range. Specific criteria were used to build ***a spatial map of priority areas that are regionally significant***. The criteria included spatial maps that depict:

1. Areas or influence zones adjacent to communities that may be influenced by large scale geographic wildfire (CTZ)
2. Watersheds that have been identified as fish and/or aquatic priority restoration areas (RP)
3. Big game winter range (BGWR: elk for MT & ID, big horn sheep for the Dakotas);
4. Municipal watersheds (MUNI)

Restoration and protection priority areas were determined by levels with prioritization given to community threat zones and municipal watersheds. The combination and intersection of these values at risk must occur on National Forest System lands.

Priority Level 1 (P1): A combination of 3 or 4 values at risk with prioritization given to CTZ and MUNI

- [CTZ or MUNI] + [RP and BGWR]
- Select an entire RP watershed that contains any amount of CTZ, BGWR or is a MUNI

Priority Level 2 (P2): A combination of 2 or 3 values at risk with prioritization given to CTZ and MUNI

- [CTZ or MUNI] + [RP or BGWR]
- Select an entire MUNI watershed that contains BGWR or is a RP watershed
- Select an entire RP watershed that contains any CTZ
- Select the portion of a CTZ that is either in a RP watershed or is BGWR

Priority Level 3 (P3): A combination of 1 or 2 values at risk with prioritization given to CTZ and MUNI

- [CTZ or MUNI]
- Select any area that is CTZ or a MUNI watershed

Priority Level 4 (P4): A combination of 2 values but not CTZ or MUNI

- [RP and BGWR]
- Select the portion of an RP watershed that intersects BGWR

Priority Level 5 (P5): One value but not CTZ or MUNI

- [RP or BGWR]
- Select any RP watershed or portion of BGWR

## Application using Gallatin National Forest data

The factors and the model are those used by the Region (v 6.03), but the Gallatin Forest's data are used instead.

- RP is either fish or watershed critical restoration needs (from Scott Barndt's task force and Mark Story's road restoration watershed priority list).
- CTZ is community threat zone from fire (WUI for the Gallatin).
- MUNI is municipal watersheds. Hyalite watersheds were added to the Regional layer.
- The Ownership layer is the Gallatin's, not the Regional layer, which reflects more recent land exchanges.
- BGWR is critical wildlife habitat (Critical Grizzly, Lynx, Sheep, or linkage corridor for the Gallatin Forest), not big game winter range.

The model uses the following hierarchical key. The first assignment that is true becomes the priority assignment for that area.

Priority Level 1 (P1):

Select an entire RP watershed that contains some amount of BGWR AND (CTZ or MUNI), *change from Regional Document per Jim Barber, 011508*

Priority Level 2 (P2):

Select an entire MUNI watershed that contains BGWR or is a RP watershed  
Select an entire RP watershed that contains any CTZ  
Select the portion of a CTZ that is either in a RP watershed or is BGWR

Priority Level 3 (P3):

Select any area that is CTZ or the entire watershed if in a MUNI watershed

Priority Level 4 (P4):

Select the entire RP watershed that intersects BGWR (*Change from Regional Document per Jim Barber 011508*)

Priority Level 5 (P5):

Select any RP watershed or an area with BGWR

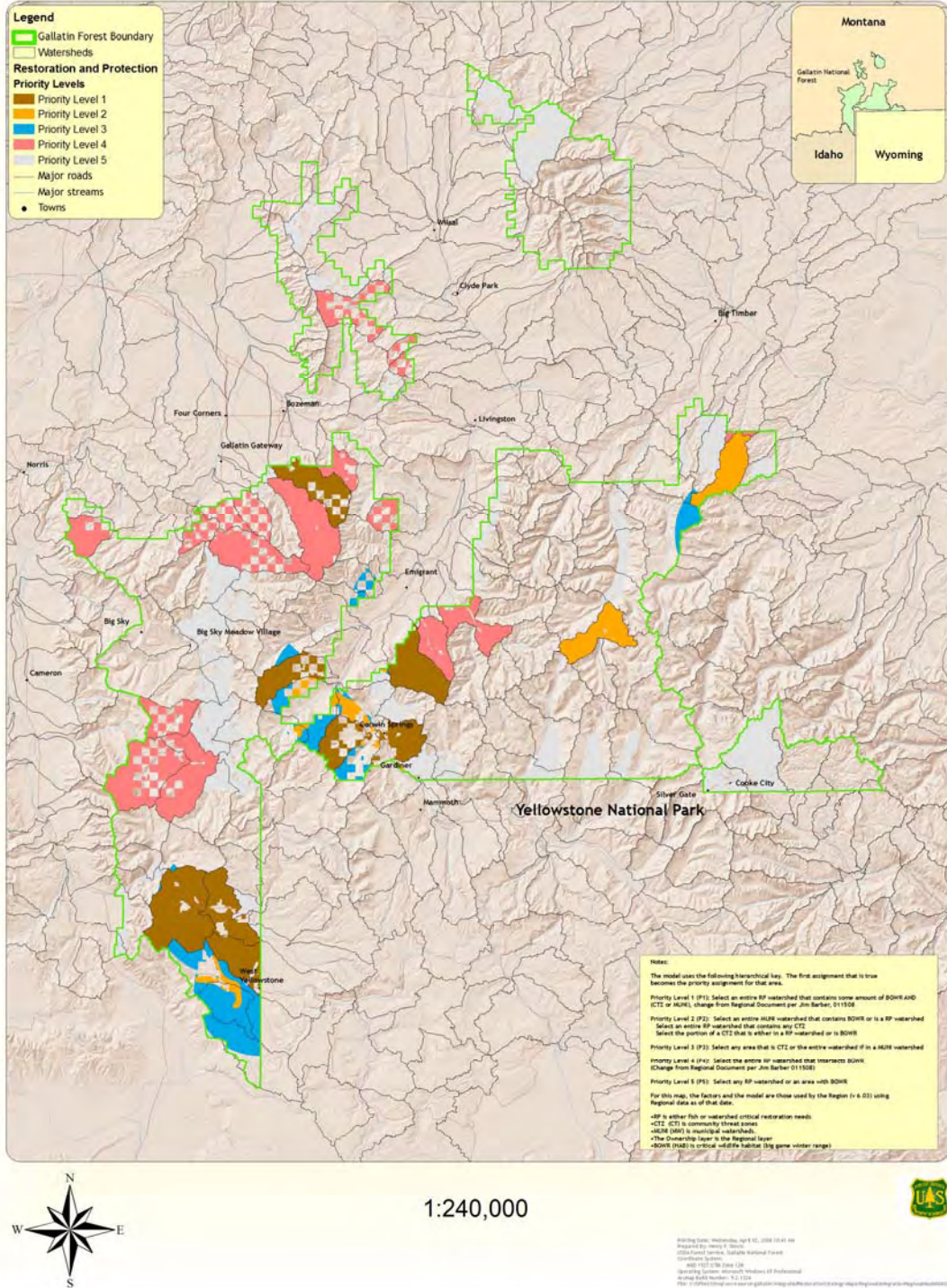
Higher priority assignments take precedence over lower ones, so if a higher priority has been assigned, it will not get re-assigned to a lower one if it also fits the lower priority's criteria. The model is skewed towards integration and restoration needs. To get a #1 priority, there has to be an RP present, and at least two other factors.

Note the changes from Jim Barber, made while I was developing the model. These changes do not change the results given by the Regional model, they merely better reflect the underlying logic than was described in the Regional web document, so that my version of the Regional model will give the same results.

I wrote a VISUAL BASIC program to run the model in ACCESS. The Regional Office used a different method (an entirely spatial one), but I felt it would be more explicit to me using a non-spatial program run on a single spatial layer in a geodatabase. I checked my results using Regional data with the Regional run and modified my program until they matched. The programming is described in the Appendix.

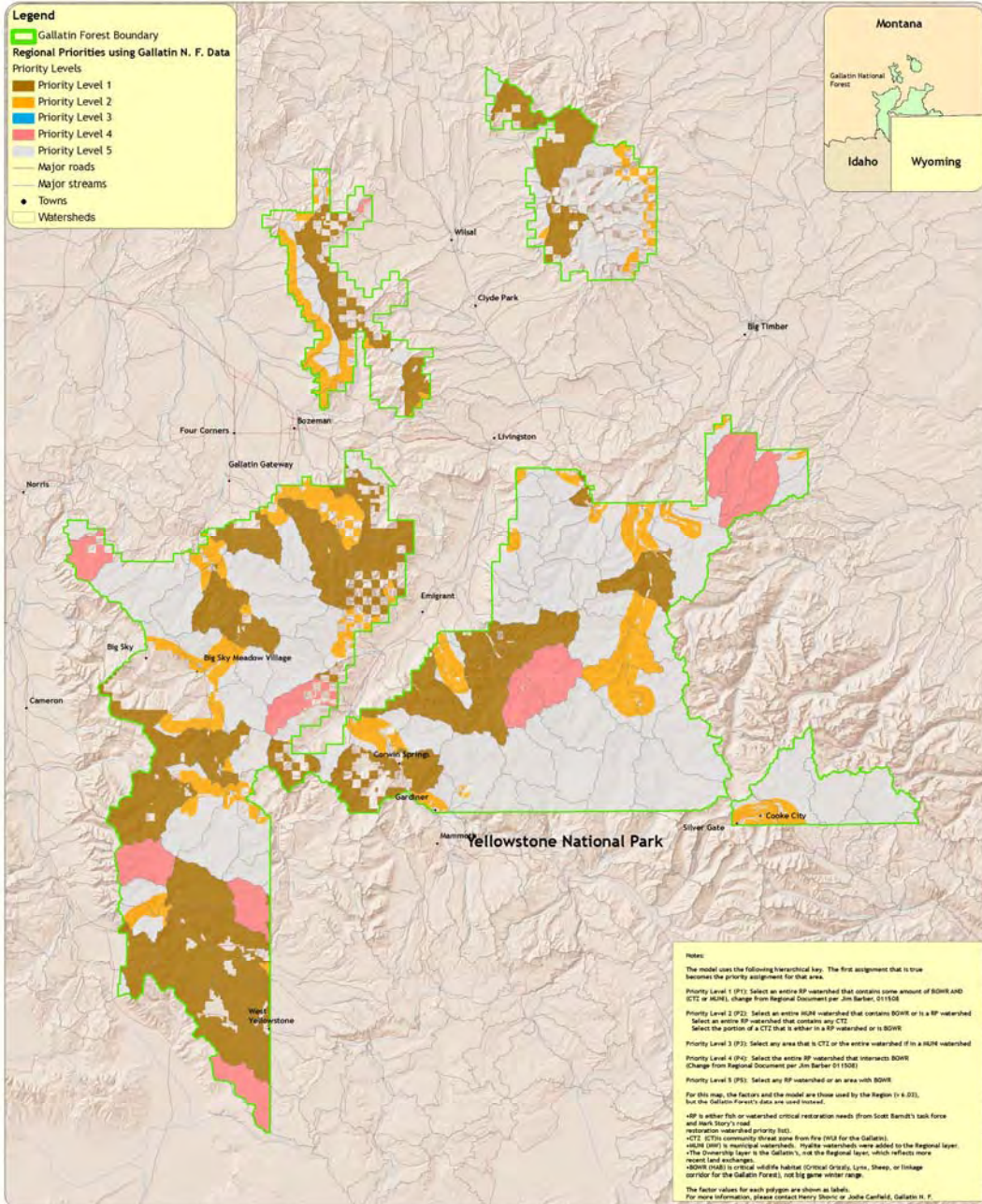
With the help of Gallatin staff I gathered local data that matched the concepts used in the RO model. Then I re-ran the Regional model with these data. Here are two maps, showing the results of each set of data.

# The Gallatin National Forest: Regional Restoration and Protection Priority Areas ( from Northern Region data - v06-3)





# The Gallatin National Forest: Regional Restoration and Protection Priority Areas using the Regional Prioritization(vs 06-3) using Gallatin Data as of 040208



Prioritization is very different. There are more #1 priorities, primarily due to coincidence of WUI and watershed restoration, and their importance in prioritizing watersheds. Only a small part of the watershed is required to have the #1 priority assignment to rate the entire watershed at that priority. Note that for the Gallatin data, all lands have a priority other than zero, which did not occur using the Regional data. This is due to wildlife habitat.

The difference in patterns is entirely due to differences in data. Following is a discussion of those differences.

### Wildlife (BGWR or HAB)

The wildlife habitat has significantly changed. The Gallatin National Forest has world renowned wildlife resources, so it may not be a surprise that wildlife is a considered a critical issue Forest wide. A number of items were used to rate wildlife habitat. We considered these areas for both restoration projects and protection. The type of potential project would vary by the species, but for grizzly bear habitat it would include things like road closures. In most cases for lynx and grizzly bear, the emphasis would lead toward protection.

Grizzly Bear - the occupied area of the Forest (currently Forest S of I-90) ranks as significant for g.bears and we have a GYA G.Bear Amendment in place  
Canada Lynx - the occupied area of the Forest (currently Forest S of I-90) also ranks as significant for lynx with the N.Rockies Lynx Management Direction in place  
Bighorn Sheep - these is one of the only big game species for which there is a population concern in our area, thus we overlaid the bighorn sheep range from MFWP range maps- this overlaps with parts of the Forest south of I-90 and potentially some future areas may occur north of I-90 on the Forest  
Linkage Areas - the Gallatin National Forest identified some important areas as linkages in both the Gallatin Travel Plan Amendment and the NRLMD. These areas are mportant for other wide-ranging species such as wolverine and potentially grizzly bears in the future. The G.Bear Amendment also references linkage areas. These areas emphasize the Bridgers/Bangtails and Crazy Mountains which provide linkages to the north (Helena and L&C NFs), as well as the area at Bozeman Pass and the southwest corner of the Forest where wide-ranging species could potentially use the Continental Divide area to move to the west and north.

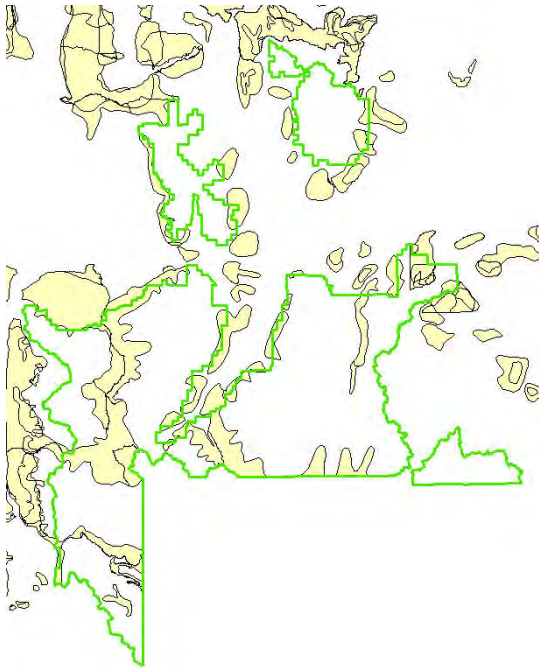


Image of RO critical wildlife habitat

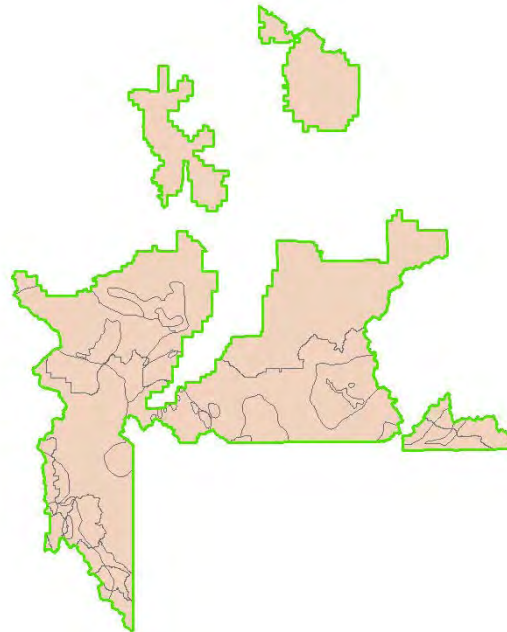


Image of Gallatin critical wildlife habitat

Note the large differences. The Gallatin data reflects critical habitat for critical species, whereas the RO data shows only big game winter range, which is not critical on the Gallatin.

## Municipal Watersheds (MW or MUNI)

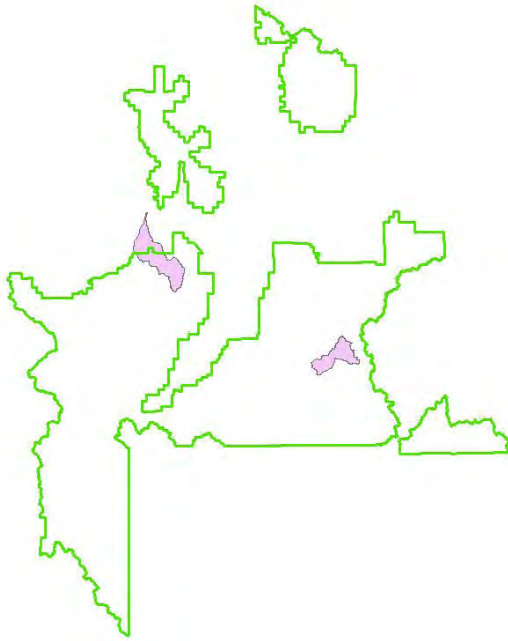


Image of RO municipal watersheds

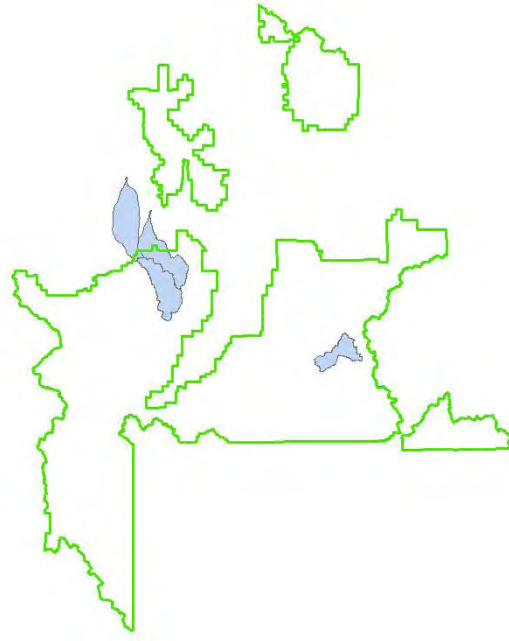


Image of Gallatin municipal watersheds

Note the addition of the Hyalite municipal watershed, which is not present in the RO layer.



## Community Threat Zones (CT or CTZ)

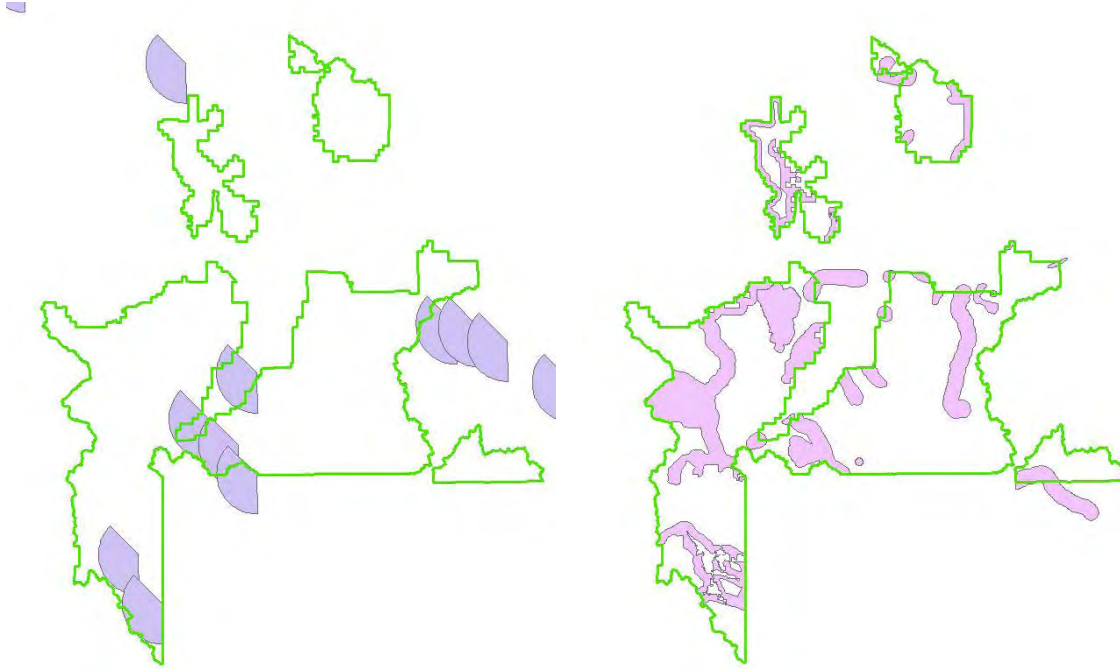


Image of RO community threat zones

Image of Gallatin community threat zones

The Gallatin data used the Wildland Urban Interface (WUI) zones. The RO zones are based on modeling around communities.

## Watershed and Fisheries Restoration Priorities (RP)

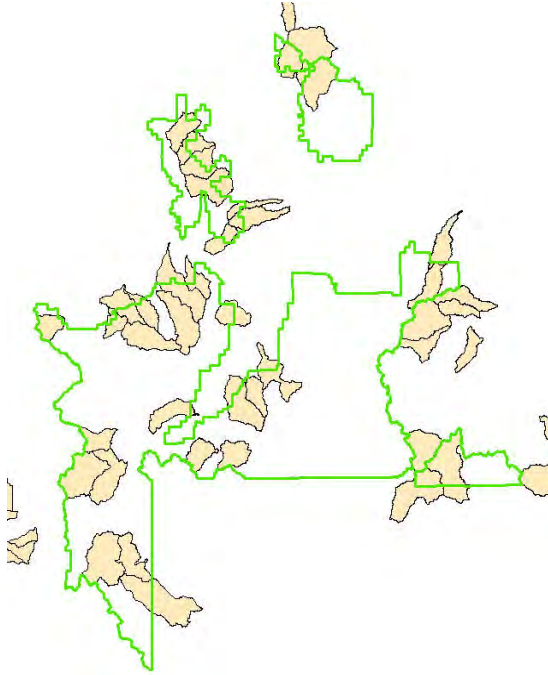


Image of RO Watershed/Fish Priorities

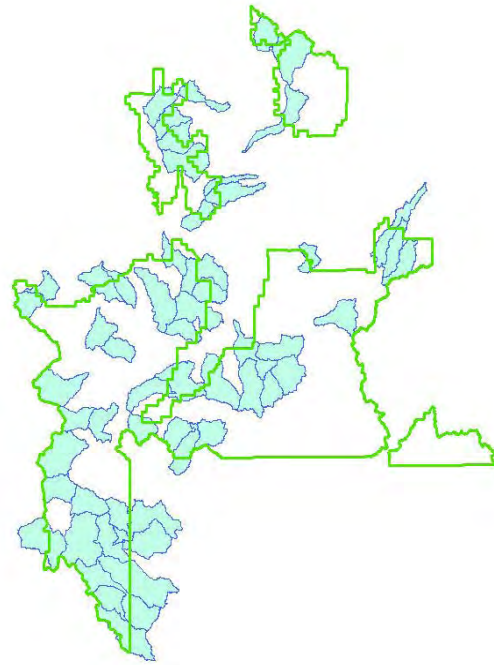


Image of Gallatin Watershed/Fish Priorities

The RO data were collected via a canvass of Forests. The Gallatin watershed data were collected by the Forest Hydrologist for watershed priorities based on restoration needs and plans, and the fisheries data were collected by a task force of local Gallatin Fish Biologists using a numerical rating system.

## Ownership

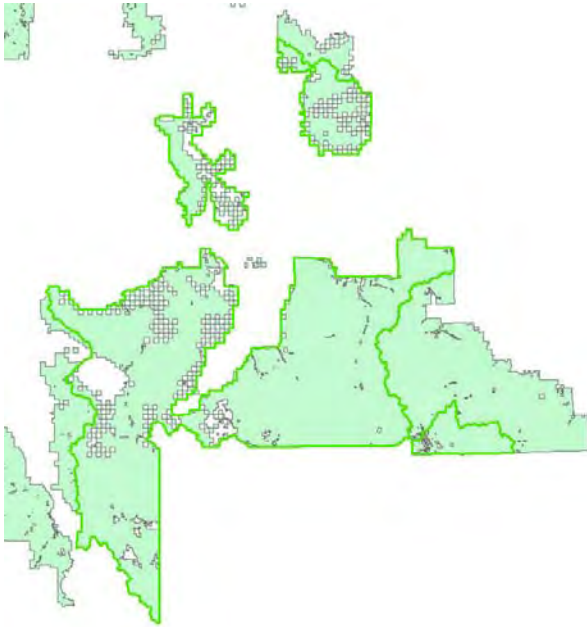


Image of RO Ownership



Image of Gallatin Ownership

The RO ownership layer does not reflect recent exchanges on the Gallatin Forest, so patterns of mapped data are somewhat different between the two model runs.

## Appendix

For those of you interested, here is the VISUAL BASIC program I wrote to run the model in ACCESS. The Regional Office used a different method (an entirely spatial one), but I chose to make it more explicit and repeatable by using a non-spatial program run on a spatial layer in a geodatabase.

-----  
Option Explicit

Option Compare Database

Sub RunRegionalIntegrationModelOnGallatinDataGEODATABASE\_based\_table()

'This sub runs the regional integration model on a table copied from  
'the geodatabase created by unioning the five layers, and  
'intersecting with the Gallatin ownership layer.

'BGWR is critical wildlife habitat (Critical Grizzly, Lynx, Sheep, or linkage corridor for  
'the Gallatin)HAB is the field name for this model.

'RP is either fish or watershed critical restoration need

'CTZ is community threat zone from fire (WUI for the Gallatin)

'MUNI is municipal watershed (same as Regional layer)

'The model is:

,

'Priority Level 1 (P1): A combination of 3 or 4 values at risk with prioritization given to CTZ and  
MUNI

' [CTZ or MUNI] + [RP and BGWR]

' Select an entire RP watershed that contains BGWR AND (CTZ or MUNI),per Jim Barber,  
011508

'Priority Level 2 (P2): A combination of 2 or 3 values at risk with prioritization given to CTZ and  
MUNI

' [CTZ or MUNI] + [RP or BGWR]

' Select an entire MUNI watershed that contains BGWR or is a RP watershed

' Select an entire RP watershed that contains any CTZ

' Select the portion of a CTZ that is either in a RP watershed or is BGWR

'Priority Level 3 (P3): A combination of 1 or 2 values at risk with prioritization given to CTZ and  
MUNI

' [CTZ or MUNI]

' Select any area that is CTZ or a MUNI watershed

'Priority Level 4 (P4): A combination of 2 values but not CTZ or MUNI

' [RP and BGWR]

' Select the RP watershed that intersects BGWR (per Jim Barber 011508)

'Priority Level 5 (P5): One value but not CTZ or MUNI

' [RP or BGWR]

' Select any RP watershed or portion of BGWR

,

'In this sub, priorities are set from 5 to 1.

'Two kinds of assignments are made:

,

'1. Assignment by watershed (if any polygon in the watershed is  
'assigned, the entire watershed is assigned.

'2. Assignment by polygon only.

,



'The input table must have the field "PRIORITY" defined before running this  
'sub. The sub initializes the field before running priority 5 assignment only.  
'Created by Henry Shovic Gallatin National Forest, Jan 10, 2008  
'Version1.2 with changes in ws prioritization by Jim Barber for priority 4 011508  
'old Version 1.1 (with changes in priority 1 by Jim Barber, 011508)

'This version runs off Gallatin data vs as of 030608  
,

'Dimension

Dim objDb As ADODB.Connection

Dim objCmd As ADODB.Command

Dim tTable As ADODB.Recordset

Dim objFldPriority As ADODB.Field

Dim objFldRP As ADODB.Field 'fish and watershed; field RP (RP)

Dim objFldCT As ADODB.Field 'community threat; field CT (CTZ)

Dim objFldMW As ADODB.Field 'Municipal watershed; field MW(MUNI)

Dim objFldWS As ADODB.Field 'Watershed number; field HUC\_12

Dim objFldHABITAT As ADODB.Field 'Critical WL habitat; HABITAT(BGWR)

Dim objFldShape\_Area As ADODB.Field

'Dim objFldObjID As ADODB.Field

Dim strCurrentWatershed As String

Dim strCurrentWSPriority As Variant

Dim numNumber As Long, icountws As Variant

'table is GallatinMunFishWSWLWUUnionOwnIntRP

Dim iCount As Integer, icounter As Integer, strTableModel As Variant, iTotlReclnWS As Variant

Dim icounterfield As Integer, stComments As String, iRegionCurrentRecordNumber As Long

Dim intCount As Integer, intCounter As Integer, strIn As String, iDepth As Integer

Dim strPreviousWSPriority As Variant

Set objCmd = New ADODB.Command

Set objDb = New ADODB.Connection

Set tTable = New ADODB.Recordset

'open database

objDb.Open "Provider=Microsoft.JET.OLEdb.4.0; Data  
Source=I:\fsfiles\fstmp\so\resource\gallatin\IntegratedRestorationStrategy\SpatialData\Integrati  
onAnalysisDatabase.mdb"

Set objCmd.ActiveConnection = objDb

tTable.CursorLocation = adUseClient

On Error GoTo error

Continue:

'Initialize variables And counters

icounter = 0 'counter for records

```

stComments = ""

strTableModel = "GallatinMunFishWSWLWUUnionOwnIntRP"
'open table
  tTable.Open strTableModel, objDb, adOpenDynamic, adLockOptimistic
' Set fields
  Set objFldPriority = tTable.Fields.Item("Priority")
  Set objFldRP = tTable.Fields.Item("RP")
  Set objFldCT = tTable.Fields.Item("CT")
  Set objFldWS = tTable.Fields.Item("huc_6th_polygon_HUC_12")
  Set objFldMW = tTable.Fields.Item("MW")
  Set objFldHABITAT = tTable.Fields.Item("HAB")
  Set objFldShape_Area = tTable.Fields.Item("Shape_Area")

'Sort table by watershed
  tTable.Sort = "huc_6th_polygon_HUC_12 asc"

Continue1:

'Go to first record in table

  tTable.MoveFirst

Do 'Loop for all records in tTable

  'determine total number of records in this watershed
  iTotalRecInWS = 0
  strCurrentWatershed = objFldWS

c4:    tTable.MoveNext

  'at last record

  If tTable.EOF = True Then

    iTotalRecInWS = iTotalRecInWS + 1
    GoTo c1
  End If

  iTotalRecInWS = iTotalRecInWS + 1

  If objFldWS = strCurrentWatershed Then

    GoTo c4
  Else
c1:    'end of watershed records, so move back to record at top of watershed
      tTable.Move -iTotalRecInWS

      End If

'now for each record in watershed run priorities.
  strCurrentWSPriority = 0

  icountws = 0 ' records in watershed

```

Do

```
icountws = icountws + 1
strPreviousWSPriority = strCurrentWSPriority
'If polygons are less than 5 acres in size, assign 0 as priority
'to account for slivers and noise. Skip prioritization for poly and watershed
  If objFldShape_Area < 20234 Then 'metric eq. of 5 ac
    objFldPriority = 0
    GoTo c6
  End If

' Priority 5

' For this priority only, initialize PRIORITY fields

  objFldPriority = 0

  'Polygon Priority

  If objFldHABITAT = "Y" Then
    objFldPriority = 5
  End If

  'Watershed Priority

  If objFldRP = 1 Then strCurrentWSPriority = 5

' Priority 4

  'Watershed Priority (rather than polygon per Barber)

  If objFldRP = 1 And objFldHABITAT = "Y" Then strCurrentWSPriority = 4

' Priority 3

  'Polygon Priority

  If (objFldCT = 1) Then objFldPriority = 3

  'Watershed priority

  If objFldMW = 1 Then strCurrentWSPriority = 3

' Priority 2

  'Polygon priority

  If objFldCT = 1 And (objFldRP = 1 Or objFldHABITAT = "Y") Then objFldPriority = 2

  'Watershed Priority
  If (objFldMW = 1 And (objFldRP = 1 Or objFldHABITAT = "Y")) Then
strCurrentWSPriority = 2
  If (objFldRP = 1 And objFldCT = 1) Then strCurrentWSPriority = 2
```

```
'If (objFldCT = 1 And objFldHABITAT = "Y") Then strCurrentWSPriority = 2
' Priority 1
```

```
'Watershed Priority
```

```
    If (objFldRP = 1 And objFldHABITAT = "Y" And (objFldCT = 1 Or objFldMW = 1))
Then strCurrentWSPriority = 1
```

```
c3:
```

```
'check if ws priority is higher than previous record
'If so, set to current ws priority, otherwise leave previous one.
    If strPreviousWSPriority = 0 Then GoTo c6 ' if previous ws is 0, leave ws priority
    Select Case strCurrentWSPriority
        Case 0 'if no ws priority assigned
            strCurrentWSPriority = strPreviousWSPriority
        Case Is < strPreviousWSPriority 'current watershed priority is higher than
previous ws priority
            'don't change priority with the watershed value
            Case Else 'replace ws priority with previous watershed priority
                strCurrentWSPriority = strPreviousWSPriority
    End Select
c6:    icounter = icounter + 1 'total record counter
```

```
tTable.MoveNext
```

```
Loop While icountws < iTotalReclnWS
```

```
'set priority for all records in watershed if set in priority list above
```

```
If strCurrentWSPriority <> 0 Then
```

```
tTable.Move -iTotalReclnWS ' go to beginning record of watershed
```

```
icountws = 0
```

```
Do
```

```
    icountws = icountws + 1
```

```
'Check for lower assigned watershed priority, which will be overridden
'for this polygon if polygon has higher priority.
```

```
    Select Case objFldPriority
```

```
        Case 0 'if no polygon priority assigned
```

```
            objFldPriority = strCurrentWSPriority
```

```
        Case strCurrentWSPriority = 0 ' if current ws priority is 0
```

```
            'don't change priority with the watershed value
```

```
        Case Is < strCurrentWSPriority 'watershed priority is lower than polygon priority
```

```
            'don't change priority with the watershed value
```

```
        Case Else 'replace polygon priority with watershed priority
```

```
            objFldPriority = strCurrentWSPriority
```

```
    End Select
```

```
'If polygons are less than 5 acres in size, assign 0 as watershed priority
```

```
'to account for slivers and noise.
```

```
    If objFldShape_Area < 20234 Then 'metric eq. of 5 ac
```



```
        objFldPriority = 0
    End If

    tTable.MoveNext

    Loop While icountws < iTotlReclnWS
End If
'now at the beginning of the next watershed

Loop While Not tTable.EOF 'loop for all records

'close and release objects
tTable.Close

Set tTable = Nothing

'Report
MsgBox "number of records written = " & icounter

Exit Sub

error:

MsgBox ("Error " & Err.Number & ". " & Err.Description & " record " & icounter)

GoTo Continue1

End Sub
```