

BBM v1.0

BBM - Better Balanced Maps 1.0

Better Balanced Maps (BBM) aims to balance spawn placement location and yields for competitive games. BBM has goals :

- Taking account for civilization biases and its priority
- Ensure minimum yields around the start location.
- Ensure having enough space to settle around the start location and ensure you can settle three more cities next to your capital.
- Balance the yields for everyone.
- Ensure as much as possible that everyone gets the same chance while maintaining a bit of luck to not make every game look the same.

BBM is best used with Better Balanced Games mod. But can be played without.

You need both expansions Rise & Fall and Gathering Storm.

For any question, suggestions, bug reports, please visit the BBG discord

<https://discord.gg/A9QHKkYA>

Get the BBM role to find the corresponding channels.

Key differences with BBS

As it is a commonly asked question, BBM has the same goal to balance spawns but do it differently.

Civ biases are the same but more important in BBM for placement the bias is almost always guaranteed ring 3 around spawn for resources for example.

Civ placement order in BBM depends on how many valid tiles there are available, instead of purely bias tier.

There are more guaranteed tiles with good yields.

Other new rules taken in account for scoring starting tiles.

All these new algorithms are detailed further in this document.

Lobby settings

Available maps

There is a predefined list of maps where BBM will work. Any other maps will see a notification after loading saying the map is not supported by BBM and standard firaxis behavior will occur.

The complete list is :

Pangaea

7 seas

Highlands (+Rich variant)

Lakes

Inland seas

Primordial

Tilted axis

Continents

Continents & islands

Small continents

Wetlands

Fractal

Splintered fractal

Island plates

Terra

New script :

Pangaea Ultima

<https://docs.google.com/document/d/1NHA13kXS-Q7UV1OURXMVHTC0uakm5jvqSHTbZYaZG40/edit?usp=sharing>

Compatible with EvW setting

New lobby settings available

Maximum size of floodplains.

By default, the standard size of a generated pack of floodplains is 10. This max size can now be chosen from 4 to 12 tiles and the new default setting is 8.

TAKE NOTE : Remember the placement is still a firaxis work for the moment and has not changed, so they can still gather up at river junctions and even sometimes on the same river next to each other to make them look bigger than the maximum setting.

Minimum BBM attempts

Amount of tries BBM will do to place all the civilizations.

By default 5, it can change from 1 to 10. More tries means longer loading but more chance to get better balance for spawn placement

Min Tiles between Players

Number of tiles between players Each map has its own minimum distance by default but it can be changed.

Teamers Start Position

For maps where it is available, can change teams positions to place Default placement or East Vs West placement. More details here :  **BBM v1.0**

New natural wonders

BBM includes new natural wonders from Terra Mirabilis mod, historically used in competitive games in CPL and CivFr. You can read their descriptions and disable them if needed in the natural wonder list setting.

- Barringer Crater
- Bioluminescent Bay
- Cerro de Potosi
- Dallol
- Grand Mesa
- Mount Kailash
- Lake Victoria
- Lençóis Maranhenses
- Krakatoa
- Mosi-oa Tunya
- Motlatsi Canyon
- Namib Sand Sea
- Rock of Gibraltar
- Old Faithful
- Lakes of Ounianga
- Salar de Uyuni
- Mount Sinai
- Sri Pada
- Vradefort Dome
- Wulingyuan

Extra hills option

A new checkbox in lobby setting is available, applying the extra hills algorithm that is used on Pangaea Ultima to other maps, adding ~10% hills on map on top of world age setting. For example : New world age = ~40% hills / New world age + extra hills = ~50% hills.

Available on Pangaea, Lakes, Seven seas, Primordial, Tilted axis (+ wraparound), Inland sea, Small continents, Continents, Continents and islands, Wetlands
(Unavailable on both highlands and by default on Pangaea Ultima)

Climate setting : Tundra only

Requested for a fun tournament, no grassland, no plains, only tundra and snow. Available on all maps.

Wraparound setting : Default - Wraparound - No wraparound

By default, Inland sea and Tilted axis are the only maps without wrap. You can change this setting on all maps now.

Map generation changes

Pangaea update

Pangaea map script has been updated to reroll the map if it has too much water in the middle on the map. This should drastically decrease the generation of “distorted” pangaea and be more consistent to be a big landmass with only tiny islands.

Rich Highlands map

Rich Highlands is a variation of Highlands where luxuries resources have a higher chance to spawn compared to Highlands and sea luxuries resources will appear. You can select it from the map list.

Ice generation

Ice tiles number on maps is now scaling on water tile percent on map.

Up to now, firaxis algo had a fixed number of desired ice tiles on any map, regardless of the number of available water tiles. Which led to weird behavior on highlands and lakes especially. This change should not affect other maps.

Sea resources spreading fix

Default firaxis placement for sea resources scans from west to east and have a limited amount of resources to place and often spread all its resources too early during the scan, letting some rare resources like strategics or luxuries to be absent on east side of the map. BBM will try to spread random luxuries and strategics to avoid this effect. Bonus resources (fish, crabs) are unaffected and initial placement is still the same.

Goody huts placement bugfix

A small bugfix has been applied to firaxis algo to prevent clustering of huts in some cases. In short, when scanning the ocean, the "score" overflows for being unable to add huts and compensate when he could add them. For example, as the scanning went from west to east, west coast of pangaea was overflowed with huts. This has now been prevented.

New City States placement algo for Pangaea Ultima, Lakes and both Highlands

Instead of random placement, a quadrant placement has been introduced for CS placement in maps with the most land. Goal is to spread them more evenly around the map and avoid random cases where they are clustered in a map corner. Minimum distance between them has also been increased from 8 to 10.

Continent normalization

An algo has been added to normalize the size of continents, starting from direct splits we can swap continents depending on their size. Due to the nature of the algo, it could only work on maps with enough land tiles to guarantee the split could be detected and reshaped, so unfortunately heavy water maps like primordial, tilted axis for example didn't work well with this solution. You can expect some unusual split shapes that could happen due to this terraform, it can be refined in future updates if needed.

Step 1 : Map scanning

Each tile is scanned, giving a density score for each terrain feature and resource 6 rings from tile.

A "peninsula score" from 0 to 100 (in percent) is given to each tile based on how many tiles within 6 rings are passable. This will be used to ensure the start has enough land for new cities.

Valid starting tiles

First, finding all the tiles that have all the conditions to be a possible starting tiles :

- Forbidden tiles : snow tiles, oasis, impassable tiles
- Maximum 1 snow tile ring 1, 3 in ring 2
- Not in 3 tiles next to map border
- No natural wonder within 4 tiles
- Peninsula score of the tile is minimum 35 (threshold to get at least space for 3 more cities around start)
- At least half of the tiles are passable in ring 1, 2 and 3, calculated independently.
- Maximum 4 floodplains tiles in ring 1 (non floodplain bias would avoid floodplains)
- No volcano in ring 1
- Coast spawn forbidden 1 tile off river (so the river can be used for a second city it not spawning on it)
- Snow avoidance : not allowed to spawn with more than 3 snow tiles ring 1+2

Finding the civs placement order

Some civilizations have starting biases with a priority named *Tier*, from 1 (highest) to 5 (lowest).

First, each bias has different conditions to make sure they are valid for the civ to place. For most cases, it is having at least one resource of this bias (resources are grouped by improvements) or a certain amount of features/terrain in ring 1 to 3.

For multiple biases civs, only one bias has to be valid to make the tile valid globally for this civ. But some biases like coast, tundra, desert, floodplains and rivers are mandatory when present. England may have an iron+coal bias, but coast is mandatory so inland tiles with iron are not valid. Dutch have both coast and river and will look for a tile that meets both conditions.

Then, all civilization placement order is based on the amount of valid tiles respecting one of the biases that are available on the map.

This design choice is to adjust the order depending on the map type and generation and in every game, always letting the civ with most constraints to be placed first.

The tier of the bias will mainly affect the scoring of the tiles (detailed below) and so will decide more about the spawn quality and the priority between 2 civ with the same bias.

When both scores are equal or for civ with no bias, order is random and will not depend on the lobby order.

To note :

- When comparing same bias civs, higher tier is prioritized on score, for example Babylon (T3 river) is placed before France (T4 river).

- If for any reason, a bias cannot be satisfied, any possible spawn tile may be used.
 - Spain has a continent + coast bias, if continents can not be found on coast, any coast valid tile will be used.

Step 2 : Spawn scoring and placement

Going through each spawnable tile, a more precise bias score is then calculated for each depending on the desired resource/feature/terrain ring 6 around the spawn.

The bias score is weighed by tier in a civ with multiple bias, for example, Mali favors a bigger desert (tier 1) over a 1 tile desert with a lot of mine resources (tier 5).

Once scored, the best tiles are selected based on :

- Bias score
- Freshwater score (fresh favored over coast for non coastal civ)
- Peninsula score, with a max score set to not favor inland spawn too much for first placed civs (can be different depending on bias).
- Tundra malus which increase for each tundra tile in ring 6 after a base threshold (tundra civs excluded ofc)
- Floodplain malus to discourage spawning fully inside floodplains for non floodplains bias.
- 2 impassable tiles in a row in ring 1 (except on coast) gives a malus to slightly adjust spawn to get at the edge of lakes or mountains and ensure a short path to the first expands combined with peninsula score.

The tile with the highest score is then selected to be the civ spawn tile.

For each tile X ring around the selected spawn is then invalidated for the next civs to place. X being the minimum player distance by default depending on map or set in the lobby settings.

A last malus is applied in team games (2 teams of any size of players) if all the members of a team are all on the same continent.

New custom biases

Some biases can be modified by other mods like BBG for balance purposes. For example, firaxis nubia and korea have "snow hills" as possible biases to satisfy that are removed in BBG.

The custom biases in BBM are :

- Spain = *Continent split bias* - a different continent can be found at maximum 4 tiles away from the starting tile. Since Spain also has coast bias, this is very restrictive and if this condition can not be met on the map, coastal spawn is favored without continent split bias.

- Sweden = *King of the north bias* - tundra tiles can be found within ring 6 of the starting tile (in most of the maps, near top or bottom of the map, except on Tilted Axis where tundra is near the middle)
- Inca = *Mountain lover bias* - Want to be closer to and have more mountains compared to standard mountains bias like America or Mapuche.
- Maya = *Hydrophobic bias* - Avoid coasts and favors a higher peninsula score than other civs. *The score of any tile will decrease the closer it is to the coast.*
- Australia = *Salty bias* - Due to its bonus, can be placed off water on coast

Not custom bias like others but slight changes to scoring and have the civ aligned with its bonus :

- Russia = *Tundra border* - Will be placed on tundra where some plain or grassland tiles can be found up to ring 3
- Canada = *Deep tundra* - Will try to be placed on tundra with a maximum of 3 non-tundra tiles up to ring 3 (snow not included)
- Mali = *Desert border* - Will be placed with at least 2 desert tiles ring 1, 3 in ring 2, and a minimum of 4 non desert tiles in ring 1+2. If this condition can not be met on the map without fresh water, an oasis is added in ring 1.

Going through each civ until they are placed.

BBM will retry multiple times to do this whole placement pattern and scoring. In all the tries, the attempt selected depends on :

- The mean score of all civs
- The civ with the lowest score

For balancing purposes regarding luxuries resources in team games, if all civilizations of the same team are set on only one continent, the mean score of this attempt gets a malus to favor spreading of the team in different continents.

Note that continent generation seems to be impossible to be properly altered (if anyone who reads this knows a way to do so, let me know).

By default, BBM makes 5 attempts and this number can be changed in the lobby setting "Minimum BBM attempts".

If for any reasons, a civ can not be placed in any try, firaxis default algorithm will be called and a **"barbarian" notification appears on the right after loading**, saying BBM did not succeed to place everyone.

Step 3 : Map balancing

After placing civ and before spawn balancing, some overall balancing on map is done :

Step 3.1 : Forest balancing

Additional forests are added randomly in areas where there is a low amount of forest and jungle. The lower the amount of forest and jungle next to the tile, the higher the chance. In default settings, there is around 18% of forest, this up the number close to 25% in v0.95.

Step 3.2 : Yields near floodplains

Flat, featureless and resourceless tiles next to floodplains have a chance to gain additional yields (increased by the number of floodplains tiles), first adding hills and can also add forests.

Step 3.3 : High yields settles on fresh water or on coast

All tiles in the map that can be settled on fresh water or on the coast with 4 food tiles or 3 prod tiles are terraformed :

- Citrus, honey and sugar on grassland => terraformed in plain (floodplains included)
- Sugar on march => marsh is removed
- Deer, gypsum or ivory on plain hills => hills are removed

Step 4 : Spawn minimum conditions

BBM will avoid giving too powerful yields in the early game while guaranteeing a minimum to give a good pace to the game.

A standard tile is considered to be a tile where food yield + prod yield = 4 without extra faith/culture/science.

A high yield tile is a 5+ yield (food + prod) or a 4 yield with extra point faith/culture/science.

Gold is not taken into account.

Rest are considered "low yields".

Step 4.1 : Cleaning the spawn - Avoid high rolls

- Ethiopia always spawns on hills
- Remove ring 1 mountains on river
- Terraform desert up to 6 ring. Desert is not taken in consideration during placement because of this step.
 - Oasis and small floodplains are removed. Terrain is changed to either plain or grass. Forest has a chance to be added to fill the lack of features.
 - There is a small chance to let some tiles stay desert.
- Remove the resource under settlers, relocated to ring 3 to not mess up with the guaranteed tiles.
- If spawning on geothermal fissure, it is deleted and all fissures in ring 1 or 2 are terraformed to hills to avoid settling on it turn 1.
- If

Step 4.2 : Apply minimum guaranteed tiles up to ring 6

- For each ring "n" up to 6, there should be at least "n+1" standard tiles.
- On the first two rings, there are 3x 2/2 in total minimum.

- Add a 3f/1p or 4f tile on the second ring to guarantee growth on the capital. (Mostly sheeps on hills or bananas in flat jungle)
- Minimum of 2 and a maximum of 3 luxury resources is allowed in ring 1 to 3. Resources are added or deleted when needed.
- Maximum of 7 luxury resources is allowed between ring 4 to 6. Extra are deleted.
- Maximum of 1 high yield tile in ring 1 or 2. The extra high yields that may be already here before are moved to ring 3, then 4 etc.
- Add all guaranteed strategic resources around the spawn. Horses and iron are within 2 rings, there can be some exception, with all the previous conditions to meet and a possible high number of floodplains or mountains that there is no tile available in ring 2 to add iron, it is then placed on ring 3. Other later strategics are placed ring 4 or 5.
- On the coast, a water tile is free ring 1 to place harbor, 1 fish on reefs (or turtles on reef) is placed ring 2.

Special case for tundras civs : a guaranteed 1 food 2 prod deer is added ring 1.

Step 4.3 : Check minimum number of hills ring 6 around starting tile

- The global percent of hills on land tiles on the map is calculated beforehand.
- The percent of hills ring 6 around spawn is measured and if this percent is below the global percent on map, random flat tiles (resourceless, can be with forest/jungle) are terraformed to hills.

Step 5 : Spawn rebalancing

Now that everyone has their guaranteed yields, other tiles needs to be balance out so each capital has a set of working tiles ring 1 and 2 around their starting tile.

Step 5.1 : Balancing costal resources on coastal civs

- After the minimum conditions are applied (fish reef or turtles) a goal score is given depending on a minimum base score and current score for every coastal civ.
- Each spawn is then nerf or improved to reach that score. Each sea resource has a score, higher if the resource is ring 1 or 2.
- It aims to give either have 2 resources ring 2, or 1 fish reef ring 2 and 2 resources ring 3.
- If the coast is not on fresh water, a one tile river is added

There is a Special case for spawn 2 tiles off coast, a fish is still added randomly on ring 3 coast to help harbor adjacency and eureka.

Step 5.2 : Calculate mean yields for each spawn and adjust accordingly

- For each spawn, ring 1+2 has a food total and a prod total. Taking the average yield into account, the goal food and goal prod is determined, and terraforming is done randomly to a tile to adjust the yield. A random value is also added to this goal yield to have more variety between games and avoids having low rolls too often..
- The goal is to be more or less 2 yield of the average goal for food and average goal for prod. A minimum base yield (+ random base to not get low roll too often) is considered.
- A goal number of standard+high yields tiles is also considered to get more or less 1 tile.

Step 5.3: In team games only, balance high yields tiles

- A maximum of 1 high yield is possible for a civ in ring 1+2.
- On team games, the same number of high yields is found for each team in ring 1+2 globally. At this step, if in a 4v4 game, 2 players in a team have a high yield and the opposing team has 1, 1 additional random player (not the one that already have one) will be given a high yield tile to balance.

Step 6 : City-states placement

City-states are placed at the end. Their initial biases are not considered so they are placed randomly with a few rules :

- A minimum of 8 tiles distance to players
- A minimum of 7 tiles between each city-state
- Cannot be placed in a single tile surrounded by impassable terrain (so they are not immediately under siege)

East vs West setting

Working only for Pangaea and Continents

If you know the rules used in BBS, these are the same in BBM. It also works for every team size.

It can also work in 1v1, making the middle of the map not available to spawn on.

In the lobby, the first half of the players are placed in a “sim position” or “backlane” far from the middle of the map. The other half are placed on “frontlane” closer to the middle.

When the number of players in a team is an odd number (3v3, 5v5...), the “extra” player will be in a sim position so in a 3v3, 1 player will be on the front, 2 will be on the back. In 3v3, 4 first players placed in the lobby will be on “sim”, the last two on “front”. It does not matter what the team order is in the lobby, it can start with 11221122 or 12212112 it won’t change anything for BBM.

This setting won’t work if the number of players for each team is different (you cannot start a 3v4 for example).

On Continents map, each team has a continent and there is no backlane or frontline positions.

Patchnote history

V1.0 to V1.10

Added map script : Tilted wraparound
EvW setting for Inland sea
Amount of floodplains on spawn is now limited in ring 2
Guaranteed fish+reef should now be more consistent on ring 2
Bugfix: volcano on lake

V0.95 to V1.0

Minimum yields in ring 1-2

The ring 1 now has a minimum of 2x 4yields tiles, including one guaranteed 2/2. The algo will not add a 4/0 by itself but these tiles can already exist before. Like before, 3x 2/2 are guaranteed on ring 1+2 and there is the 3+ food tiles guaranteed.

Spawn one tile off coast will grant a fish on ring 3 if there is not enough sea resources (crabs excluded)

For helping spawns needing to settle coast while not spawning directly on it, a fish is added to help if there is not enough sea resources or no fish at all. (Crabs not included in the analysis).

Sea resources spreading fix

There is a limited amount of luxuries and strategics sea resources possible to place on the map, but the chance to add them is quite high while scanning the map and goes from west to east. As a result, most of these resources end up missing in the east side of the map quite often. Now, luxuries and strategics resources on water will

be randomly distributed on the map. **NOTE : Bonus resources such as fishes and crabs are NOT changed !**

Fix desert terraforming that was 100% into plains, now into a mix of grassland and plains

In 0.95 the desert terraforming around the spawn was only into plains, now it can also terraform into grassland to avoid huge patches of only plains. Plains will still be a bit more frequent.

Maya hydrophobic bias bugfix

In some cases, Maya would find itself with not enough valid tiles for its bias and get into the "generic" valid tiles list to be placed on, ending up sometimes on the coast. A malus in the score has been added to discourage getting close to the coast if we get into this situation.

Mountains and Inca bias update

The goal is to reduce occurrences of these civ spawning in huge rows of mountains. They might not be the civ with the most mountains around after the changes but they will still be always around, hopefully less oppressing. To help this, BBM now favors spawns with more walkable tiles (higher "peninsula score") and the bias score has been recalculated to reduce the maximum amount of mountains to reach the max score. They will still look for at least 2 mountains in ring 3 (ring 2 for Inca).